

ENGINEERING  
TOMORROW



Application Guide

# VACON® NX All-in-One



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**VACON®**



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# 1 Introduction

## 1.1 Purpose of this Application Guide

This Application Guide provides information on functions of different applications, available parameters, and alarms to help in configuring the system, programming, and troubleshooting the AC drive. It is intended for use by qualified personnel. Read and follow the instructions to use the drive safely and professionally. Pay particular attention to the safety instructions and general warnings that are provided in this manual and other documentation delivered with the drive.

## 1.2 Manual and Software Version

This manual is regularly reviewed and updated. All suggestions for improvement are welcome.

The original language of this manual is English.

**Table 1: Manual and Software Version**

Manual Edition	Remarks	Software code
DPD00903G	<ul style="list-style-type: none"> <li>New and updated parameters in Multi-Purpose Control Application (Monitoring values, Fieldbus parameters, and Motor Control parameters).</li> <li>Layout changes and other minor changes throughout the manual.</li> </ul>	<ul style="list-style-type: none"> <li>Basic Application = ASFIF01</li> <li>Standard Application = ASFIF02</li> <li>Local/Remote Control Application = ASFIF03</li> <li>Multi-step Speed Control Application = ASFIF04</li> <li>PID Control Application = ASFIF05</li> <li>Multi-purpose Control Application                             <ul style="list-style-type: none"> <li>VACON® NXS = ASFIF06</li> <li>VACON® NXP = APFIF06</li> </ul> </li> <li>Pump and Fan Control Application = ASFIF07</li> </ul>

## 1.3 Additional Resources

Other resources are available to understand advanced AC drive functions and operation.

- VACON® NXS/NXP Air-cooled Wall-mounted and Standalone Operating Guide
- VACON® NXP NXC User Manual
- VACON® NXP IP00 User Manual
- VACON® NXP Liquid Cooled User Manual
- Instructions for operation with option boards and other optional equipment.

Supplementary publications and manuals are available from Danfoss.

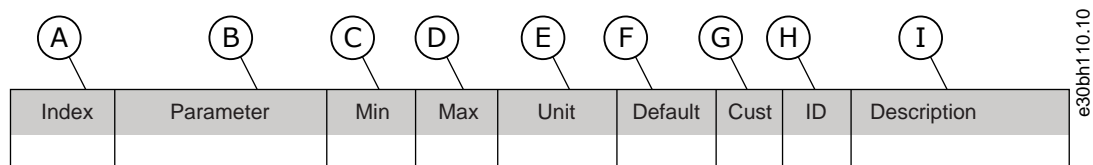
For US and Canada market:

NOTE! Download the English and French product manuals with applicable safety, warning and caution information from <https://www.danfoss.com/en/service-and-support/>.

REMARQUE Vous pouvez télécharger les versions anglaise et française des manuels produit contenant l'ensemble des informations de sécurité, avertissements et mises en garde applicables sur le site <https://www.danfoss.com/en/service-and-support/>.

### 1.4 Parameter Table Reading Guide

This manual includes a large quantity of parameter tables. These instructions tell you how to read the tables.



<b>A</b> The location of the parameter in the menu, that is, the parameter number.	<b>B</b> The name of the parameter.
<b>C</b> The minimum value of the parameter.	<b>D</b> The maximum value of the parameter.
<b>E</b> The unit of the value of the parameter. The unit shows if it is available.	<b>F</b> The value that was set in the factory.
<b>G</b> The customer's own setting.	<b>H</b> The ID number of the parameter.
<b>I</b> A short description of the values of the parameter and/or its function.	

Illustration 1: Parameter Table Reading Guide



## 2 Basic Application

### 2.1 Introduction to Basic Application

The Basic Application is a simple and easy-to-use application. It is the default setting on delivery from the factory. Otherwise select the Basic Application in menu *M6* on page *S6.2*. See the User Manual of the product.

Digital input DIN 3 is programmable.

The parameters of the Basic Application are explained in Chapter Parameter descriptions of this manual. The explanations are arranged according to the individual ID number of the parameter.

#### 2.1.1 Motor Protection Functions in the Basic Application

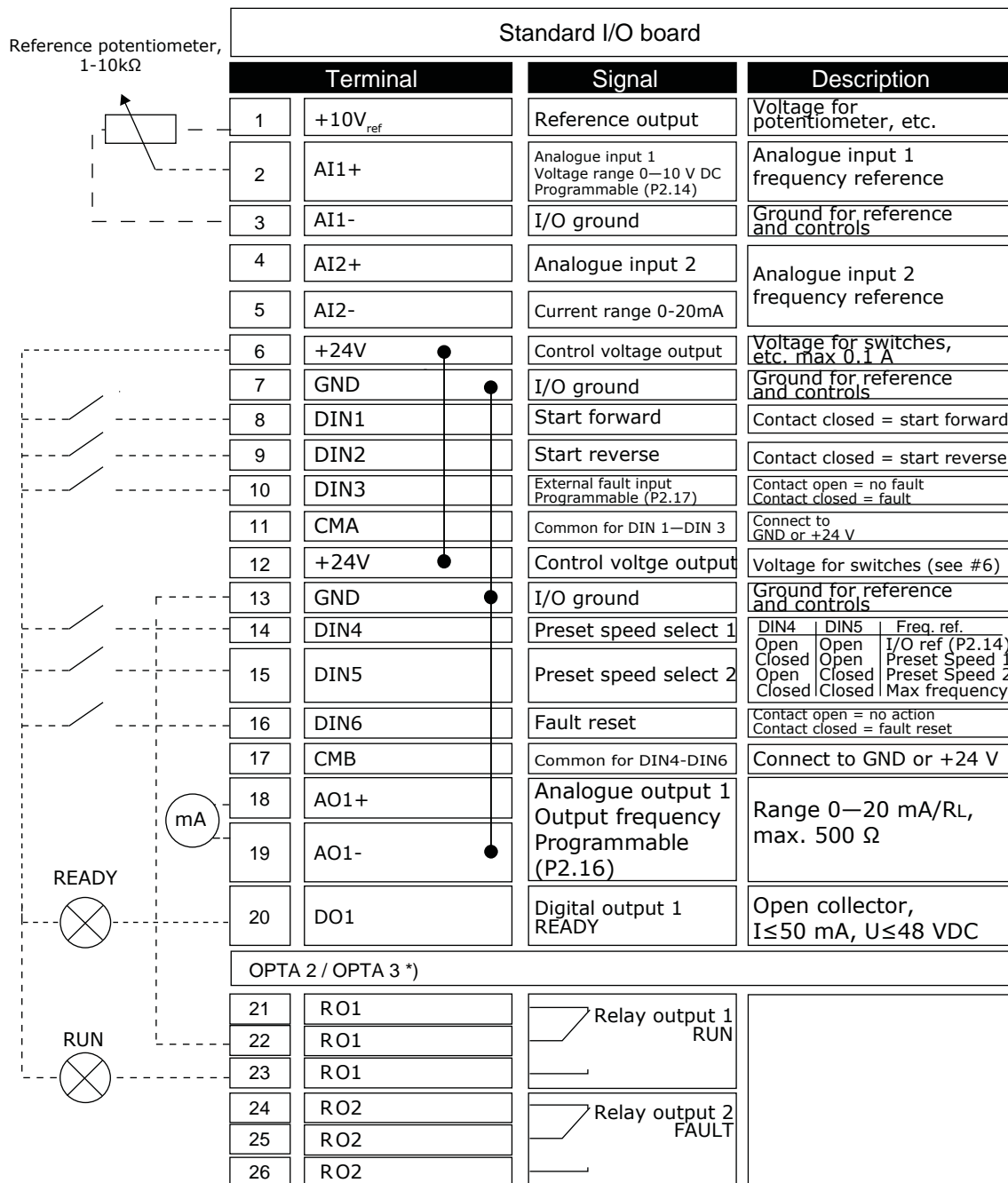
The Basic Application provides almost all the same protection functions as the other applications:

- External fault protection
- Input phase supervision
- Undervoltage protection
- Output phase supervision
- Earth fault protection
- Motor thermal protection
- Thermistor fault protection
- Fieldbus fault protection
- Slot fault protection

Unlike the other applications, the Basic Application does not provide any parameters for choosing the response function or limit values for the faults. For more information on the motor thermal protection, see [10.336 \(ID 704\) Motor Thermal Protection](#) and [10.520 Parameters of Motor Thermal Protection \(IDs 704–708\)](#).

## 2.2 Control I/O in Basic Application

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\* The option board A3 has no terminal for open contact on its second relay output (terminal 24 is missing).

Illustration 2: Default I/O Configuration in Basic Application

See jumper selections in [illustration 3](#). More information in the User Manual of the product.

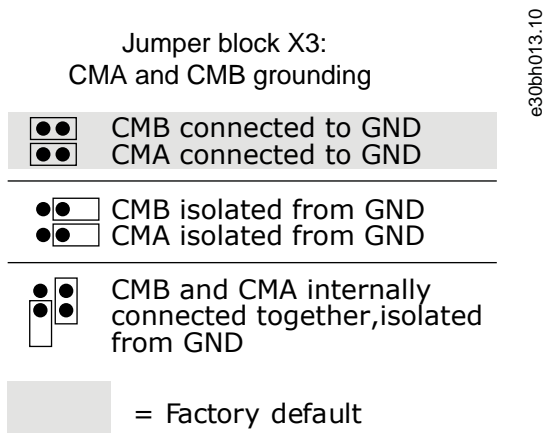
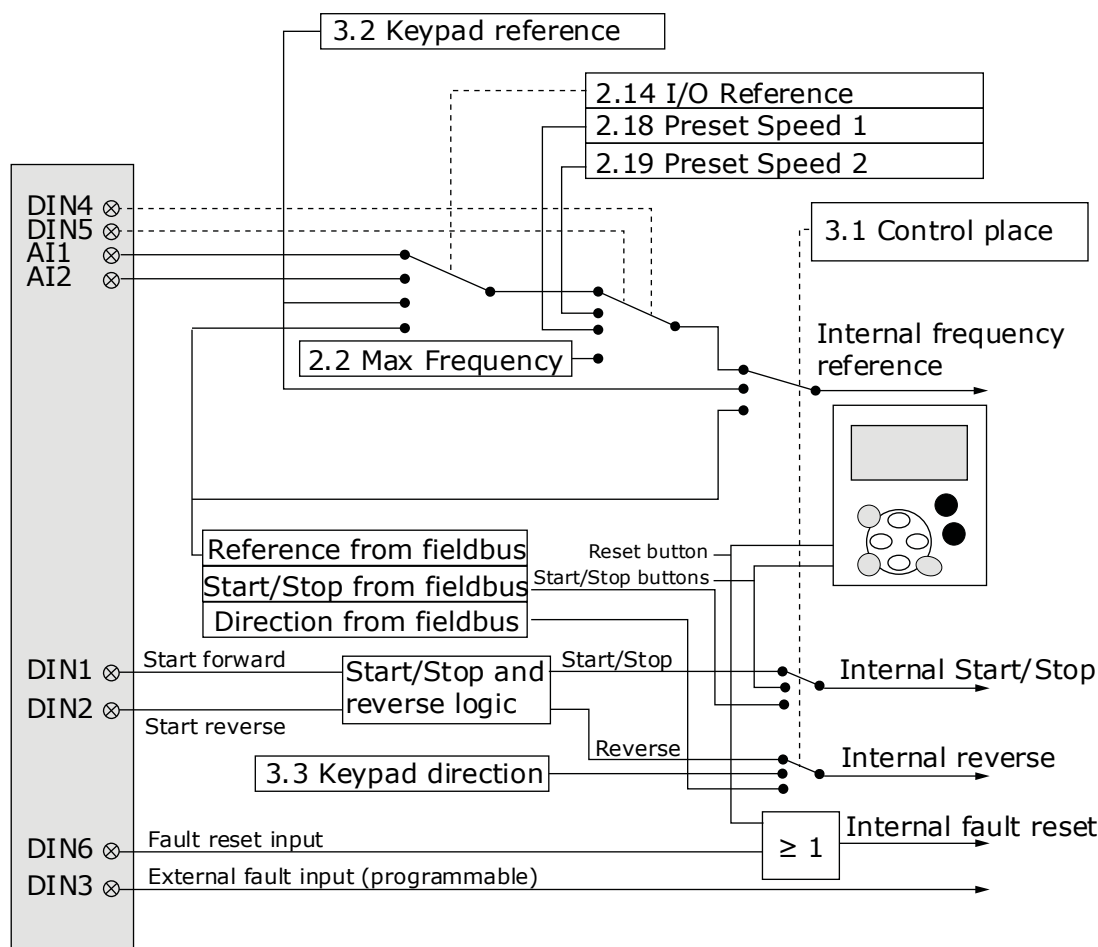


Illustration 3: Jumper Selections

### 2.3 Control Signal Logic in Basic Application



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Illustration 4: Control Signal Logic of the Basic Application

## 2.4 Parameter Lists for Basic Application

### 2.4.1 Monitoring Values (Control Panel: Menu M1)

The monitoring values are the actual values of parameters and signals as well as statuses and measurements. Monitoring values cannot be edited.

Table 2: Monitoring Values

Index	Monitoring value	Unit	Form	ID	Description
V1.1	Output frequency	Hz	###	1	
V1.2	Frequency reference	Hz	###	25	
V1.3	Motor speed	RPM	#	2	
V1.4	Motor current	A	Varies	3	



Index	Monitoring value	Unit	Form	ID	Description
V1.5	Motor torque	%	##	4	
V1.6	Motor shaft power	%	##	5	
V1.7	Motor voltage	V	##	6	
V1.8	DC-link voltage	V	#	7	
V1.9	Unit temperature	°C	#	8	
V1.10	Motor temperature	%	##	9	
V1.11	Analog input 1	V/mA	###	13	
V1.12	Analog input 2	V/mA	###	14	
V1.13	DIN 1, 2, 3			15	
V1.14	DIN 4, 5, 6			16	
V1.15	DO1, RO1, RO2			17	
V1.16	Analog I <sub>out</sub>	mA	###	26	
V1.17	Multimonitoring items				

## 2.4.2 Basic Parameters (Control Panel: Menu M2 -> G2.1)

**Table 3: Basic Parameters G2.1**

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.1	Min frequency	0.00	P2.2	Hz	0.00		101	
P2.2	Max frequency	P2.1	320.00	Hz	50.00		102	
P2.3	Acceleration time 1	0.1	3000.0	s	3.0		103	
P2.4	Deceleration time 1	0.1	3000.0	s	3.0		104	
P2.5	Current limit	0.1 x I <sub>H</sub>	2 x I <sub>H</sub>	A	I <sub>L</sub>		107	
P2.6	Nominal voltage of the motor	180	690	V	NX2: 230 V NX5: 400 V NX6: 690 V		110	
P2.7	Nominal frequency of the motor	8.00	320.00	Hz	50.00		111	
P2.8	Nominal speed of the motor	24	20 000	RPM	1440		112	
P2.9	Nominal current of the motor	0.1 x I <sub>H</sub>	2 X I <sub>H</sub>	A	I <sub>H</sub>		113	
P2.10	Motor cos phi	0.30	1.00		0.85		120	

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.11	Start function	0	2		0		505	0 = Ramp 1 = Flying start 2 = Conditional flying start
P2.12	Stop function	0	3		0		506	0 = Costing 1 = Ramp 2 = Ramp + Run enable coast Ramp 3 = Coast + Run enable ramp
P2.13	U/f optimisation	0	1		0		109	0 = Not used 1 = Automatic torque boost
P2.14	I/O reference	0	3		0		117	0 = AI1 1 = AI2 2 = Keypad 3 = Fieldbus
P2.15	Analog input 2, reference offset	0	1		1		302	0 = 0–20 mA 1 = 4–20 mA
P2.16	Analog output function	0	8		1		307	0 = Not used 1 = Output freq. (0- fmax) 2 = Freq. reference (0-fmax) 3 = Motor speed (0-Motor nominal speed) 4 = Output current (0-InMotor) 5 = Motor torque (0-TnMotor) 6 = Motor power (0-PnMotor) 7 = Motor voltage (0-UnMotor) 8 = DC-link volt (0-1000V)

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.17	DIN 3 function	0	7		1		301	0 = Not used 1 = Ext. fault, closing cont. 2 = Ext. fault, opening cont. 3 = Run enable, cc 4 = Run enable, oc 5 = Force cp. to IO 6 = Force cp. to keypad 7 = Force cp. to fieldbus
P2.18	Preset speed 1	0.00	P2.2	Hz	0.00		105	
P2.19	Preset speed 2	0.00	P2.2	Hz	50.00		106	
P2.20	Automatic restart	0	1		0		731	0 = Disabled 2 = Enabled

### 2.4.3 Keypad Control (Control Panel: Menu M3)

The parameters for the selection of control place and direction on the keypad are listed in [table 4](#). See the *Keypad control* menu in the User Manual of the product.

Table 4: Keypad Control Parameters, M3

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P3.1	Control place	1	3		1		125	1 = I/O terminal 2 = Keypad 3 = Fieldbus
P3.2	Keypad reference	P2.1	P2.2	Hz	0.00			
P3.3	Direction (on keypad)	0	1		0		123	0 = Forward 1 = Reverse
R3.4	Stop button	0	1		1		114	0 = Limited function of Stop button 1 = Stop button always enabled

### 2.4.4 System Menu (Control Panel: Menu M6)

For more information related to the general use of the AC drive, such as selecting application and language, customized parameter sets, or hardware and software, see the User Manual of the product.

### 2.4.5 Expander Boards (Control Panel: Menu M7)

The *M7* menu shows the expander and option boards attached to the control board and board-related information. For more information, see the User Manual of the product.



## 3 Standard Application

### 3.1 Introduction to Standard Application

Select the Standard Application in menu *M6* on page *S6.2*.

The Standard Application is typically used in pump and fan applications and conveyors for which the Basic Application is too limited but where no special features are needed.

- The Standard Application has the same I/O signals and the same control logic as the Basic Application.
- Digital input DIN 3 and all the outputs are freely programmable.

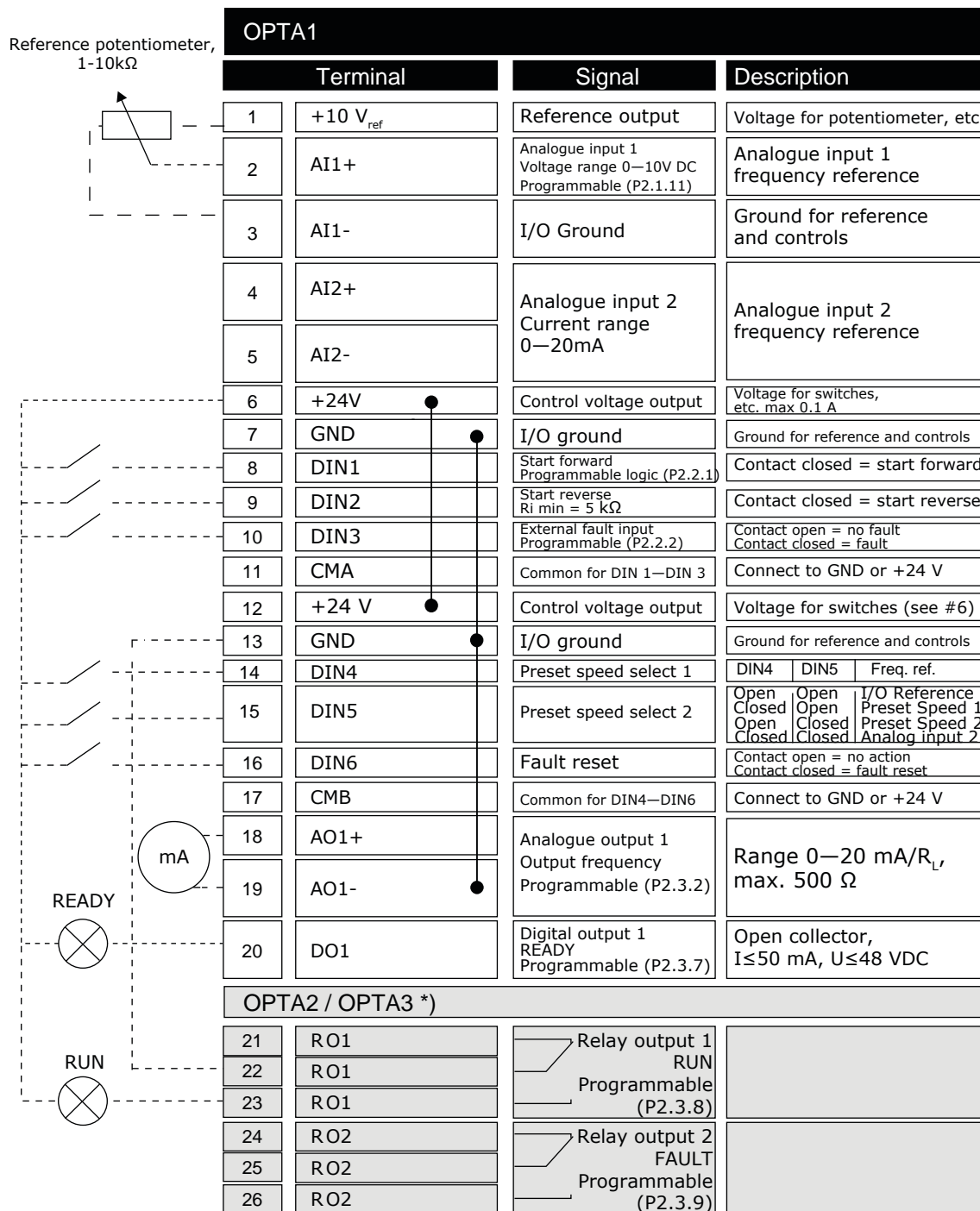
#### Extra functions:

- Programmable Start/Stop and Reverse signal logic
- Reference scaling
- One frequency limit supervision
- Second ramps and S-shape ramp programming
- Programmable start and stop functions
- DC brake at stop
- One prohibit frequency area
- Programmable U/f curve and switching frequency
- Auto restart
- Motor thermal and stall protection: Programmable action; off, warning, fault

The parameters of the Standard Application are explained in Chapter Parameter descriptions of this manual. The explanations are arranged according to the individual ID number of the parameter.

### 3.2 Control I/O in Standard Application

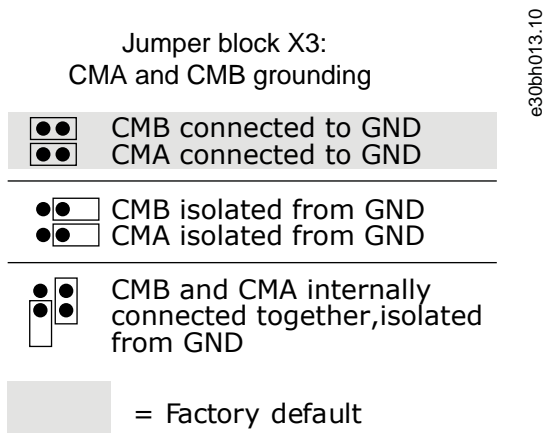
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\* The option board A3 has no terminal for open contact on its second relay output (terminal 24 is missing).

Illustration 5: Default I/O Configuration in Standard Application

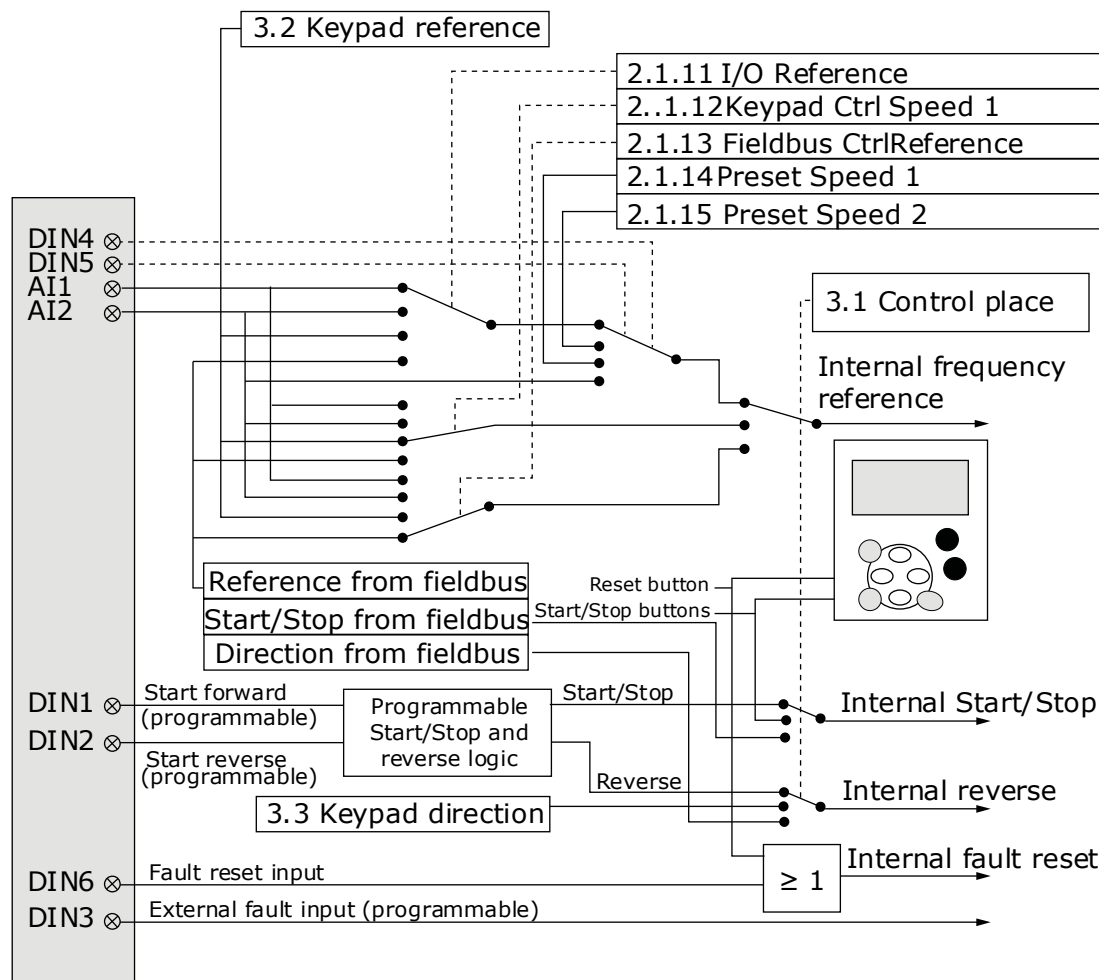
See jumper selections in [illustration 6](#). More information in the User Manual of the product.



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Illustration 6: Jumper Selections

### 3.3 Control Signal Logic in Standard Application



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Illustration 7: Control Signal Logic of the Standard Application

### 3.4 Parameter Lists for Standard Application

#### 3.4.1 Monitoring Values (Control Panel: Menu M1)

The monitoring values are the actual values of parameters and signals as well as statuses and measurements. Monitoring values cannot be edited.

Table 5: Monitoring Values

Index	Monitoring value	Unit	Form	ID	Description
V1.1	Output frequency	Hz	###	1	
V1.2	Frequency reference	Hz	###	25	
V1.3	Motor speed	RPM	#	2	
V1.4	Motor current	A	Varies	3	



Index	Monitoring value	Unit	Form	ID	Description
V1.5	Motor torque	%	##	4	
V1.6	Motor shaft power	%	##	5	
V1.7	Motor voltage	V	##	6	
V1.8	DC-link voltage	V	#	7	
V1.9	Unit temperature	°C	#	8	
V1.10	Motor temperature	%	##	9	
V1.11	Analog input 1	V/mA	###	13	
V1.12	Analog input 2	V/mA	###	14	
V1.13	DIN 1, 2, 3			15	
V1.14	DIN 4, 5, 6			16	
V1.15	DO1, RO1, RO2			17	
V1.16	Analog I <sub>out</sub>	mA	###	26	
V1.17	Multimonitoring items				

### 3.4.2 Basic Parameters (Control Panel: Menu M2 -> G2.1)

**Table 6: Basic Parameters G2.1**

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.1.1	Min frequency	0.00	P2.1.2	Hz	0.00		101	
P2.1.2	Max frequency	P2.1.1	320.00	Hz	50.00		102	
P2.1.3	Acceleration time 1	0.1	3000.0	s	0.0		103	
P2.1.4	Deceleration time 1	0.1	3000.0	s	0.0		104	
P2.1.5	Current limit	0.1 x I <sub>H</sub>	2 x I <sub>H</sub>	A	I <sub>L</sub>		107	
P2.1.6	Nominal voltage of the motor	180	690	V	NX2: 230 V NX5: 400 V NX6: 690 V		110	
P2.1.7	Nominal frequency of the motor	8.00	320.00	Hz	50.00		111	
P2.1.8	Nominal speed of the motor	24	20 000	RPM	1440		112	
P2.1.9	Nominal current of the motor	0.1 x I <sub>H</sub>	2 X I <sub>H</sub>	A	I <sub>H</sub>		113	
P2.1.10	Motor cos phi	0.30	1.00		0.85		120	
P2.1.11	I/O reference	0	3		0		117	0 = AI1 1 = AI2 2 = Keypad 3 = Fieldbus

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.1.12	Keypad control reference	0	3		2		121	0 = AI1 1 = AI2 2 = Keypad 3 = Fieldbus
P2.1.13	Fieldbus control reference	0	3		3		122	0 = AI1 1 = AI2 2 = Keypad 3 = Fieldbus
P2.1.14	Preset speed 1	0.00	P2.1.2	Hz	10.00		105	
P2.1.15	Preset speed 2	0.00	P2.1.2	Hz	50.00		106	

### 3.4.3 Input Signals (Control Panel: Menu M2 -> G2.2)

Table 7: Input Signals, G2.2

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.2.1	Start/Stop logic	0	6		0		300	<p><b>Logic = 0</b></p> <p>Ctrl sgn 1 = Start forward</p> <p>Ctrl sgn 2 = Start reverse</p> <p><b>Logic = 1</b></p> <p>Ctrl sgn1 = Start/ Stop</p> <p>Ctrl sgn 2 = Reverse</p> <p><b>Logic = 2</b></p> <p>Ctrl sgn 1 = Start/ Stop</p> <p>Ctrl sgn 2 = Run enable</p> <p><b>Logic = 3</b></p> <p>Ctrl sgn 1 = Start pulse (edge)</p> <p>Ctrl sgn 2 = Stop pulse</p> <p><b>Logic = 4</b></p> <p>Ctrl sgn 1 = Forward pulse (edge)</p> <p>Ctrl sgn 2 = Reverse pulse (edge)</p> <p><b>Logic = 5</b></p> <p>Ctrl sgn 1 = Start pulse (edge)</p> <p>Ctrl sgn 2 = Reverse pulse</p> <p><b>Logic = 6</b></p> <p>Ctrl sgn 1 = Start pulse (edge)</p> <p>Ctrl sgn 2 = Enable pulse</p>

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.2.2	DIN 3 function	0	8		1		301	0 = Not used 1 = Ext. fault, closing cont. 2 = Ext. fault, opening cont. 3 = Run enable 4 = Acc./Dec. time select. 5 = Force cp. to IO 6 = Force cp. to keypad 7 = Force cp. to fieldbus 8 = Reverse
P2.2.3 <sup>(1)</sup>	Analog input 2 reference offset	0	1		1		302	0 = 0–20 mA (0–10 V) 1 = 4–20 mA (2–10 V)
P2.2.4	Reference scaling minimum value	0.00	320.00	Hz	0.00		303	
P2.2.5	Reference scaling maximum value	0.00	320.00	Hz	0.00		304	
P2.2.6	Reference inversion	0	1		0		305	0 = Not inverted 1 = Inverted
P2.2.7	Reference filter time	0.00	10.00	s	0.10		306	0 = No filtering
P2.2.8 <sup>(2)</sup>	AI1 signal selection				A1		377	
P2.2.9 <sup>(2)</sup>	AI2 signal selection				A2		388	

<sup>1</sup> Remember to place jumpers of block X2 according to the selection (0 or 1). See the User Manual of the product.

<sup>2</sup> Use TTF method to program these parameters, see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#).

### 3.4.4 Output Signals (Control Panel: Menu M2 ->G2.3)

Table 8: Output Signals, G2.3

Index	Parameter	Min	Max	Unit	De- fault	Cust	ID	Description
P2.3.1 <sup>(1)</sup>	Analog output 1 signal selection	0			A.1		464	

Index	Parameter	Min	Max	Unit	De- fault	Cust	ID	Description
P2.3.2	Analog output function	0	8		1		307	0 = Not used (20 mA/10V) 1 = Output freq. (0- $f_{max}$ ) 2 = Freq. reference (0- $f_{max}$ ) 3 = Motor speed (0-Motor nominal speed) 4 = Motor current (0- $I_{nMotor}$ ) 5 = Motor torque (0- $T_{nMotor}$ ) 6 = Motor power (0- $P_{nMotor}$ ) 7 = Motor voltage (0- $U_{nMotor}$ ) 8 = DC-link volt (0-1000V)
P2.3.3	Analog output filter time	0.00	10.00	s	1.00		308	0 = No filtering
P2.3.4	Analog output inversion	0	1		0		309	0 = Not inverted 1 = Inverted
P2.3.5	Analog output minimum	0	1		0		310	0 = 0 mA (0 V) 1 = 4 mA (2 V)
P2.3.6	Analog output scale	10	1000	%	100		311	

Index	Parameter	Min	Max	Unit	De- fault	Cust	ID	Description
P2.3.7	Digital output 1 function	0	16		1		312	0 = Not used 1 = Ready 2 = Run 3 = Fault 4 = Fault inverted 5 = AC drive overheat warning 6 = Ext. fault or warning 7 = Ref. fault or warning 8 = Warning 9 = Reversed 10 = Preset speed 1 11 = At speed 12 = Motor regulator active 13 = OP freq. limit 1 superv. 14 = Control place: I/O 15 = Thermistor fault/warning 16 = Fieldbus DIN 1
P2.3.8	RO1 function	0	16		2		313	As parameter 2.3.7
P2.3.9	RO2 function	0	16		3		314	As parameter 2.3.7
P2.3.10	Output frequency limit 1 supervision	0	2		0		315	0 = No limit 1 = Low limit supervision 2 = High limit supervision
P2.3.11	Output frequency limit 1; Supervised value	0.00	320.00	Hz	0.00		316	
P2.3.12 <sup>(1)</sup>	Analog output 2 signal selection	0.1	E.10		0.1		471	
P2.3.13	Analog output 2 function	0	8		4		472	As parameter 2.3.2
P2.3.14	Analog output 2 filter time	0.00	10.00	s	1.00		473	0 = No filtering



Index	Parameter	Min	Max	Unit	De- fault	Cust	ID	Description
P2.3.15	Analog output 2 inversion	0	1		0		474	0 = Not inverted 1 = Inverted
P2.3.16	Analog output 2 minimum	0	1		0		475	0 = 0 mA (0 V) 1 = 4 mA (2 V)
P2.3.17	Analog output 2 scaling	10	1000	%	1.00		476	

1

### 3.4.5 Drive Control Parameters (Control Panel: Menu M2->G2.4)

Table 9: Drive Control Parameters, G2.4

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.4.1	Ramp 1 shape	0.0	10.0	s	0.1		500	0 = Linear 100 = full acc/dec inc/dec times
P2.4.2	Ramp 2 shape	0.0	10.0	s	0.0		501	0 = Linear 100 = full acc/dec inc/dec times
P2.4.3	Acceleration time 2	0.1	3000.0	s	1.0		502	
P2.4.4	Deceleration time 2	0.1	3000.0	s	1.0		503	
P2.4.5	Brake chopper	0	4		0		504	0 = Disabled 1 = Used when running 2 = External brake chopper 3 = Used when stopped/running 4 = Used when running (no testing)
P2.4.6	Start function	0	2		0		505	0 = Ramp 1 = Flying start 2 = Conditional flying start
P2.4.7	Stop function	0	3		0		506	0 = Coasting 1 = Ramp 2 = Ramp+Run enable coast 3 = Coast+Run enable ramp
P2.4.8	DC braking current	0.00	$I_L$	A	$0.7 \times I_H$		507	
P2.4.9	DC braking time at stop	0.00	600.00	s	0.00		508	0 = DC brake is off at stop

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.4.10	Frequency to start DC braking during ramp stop	0.10	10.00	Hz	1.50		515	
P2.4.11	DC braking time at start	0.00	600.00	s	0.00		516	0 = DC brake is off at start
P2.4.12	Flux brake	0	1		0		520	0 = Off 1 = On
P2.4.13	Flux braking current	0.00	$I_L$	A	$I_H$		519	

### 3.4.6 Prohibit Frequency Parameters (Control Panel: Menu M2 -> G2.5)

Table 10: Prohibit Frequency Parameters, G2.5

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.5.1	Prohibit frequency range 1 low limit	0.00	320.00	Hz	0.00		509	
P2.5.2	Prohibit frequency range 1 high limit	0.00	320.00	Hz	0.00		510	
P2.5.3	Prohibit acc./dec. ramp	0.1	10.0	x	0.1		518	

### 3.4.7 Motor Control Parameters (Control Panel: Menu M2 -> G2.6)

Table 11: Motor Control Parameters, G2.6

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.6.1 <sup>(1)</sup>	Motor control mode	0	1/4		0		600	0 = Frequency control 1 = Speed control <b>VACON® NXP:</b> 2 = Open loop torque control 3 = Closed loop speed ctrl 4 = Closed loop torque control
P2.6.2 <sup>(1)</sup>	U/f optimisation	0	1		0		109	0 = Not used 1 = Automatic torque boost
P2.6.3 <sup>(1)</sup>	U/f ratio selection	0	3		0		108	0 = Linear 1 = Squared 2 = Programmable 3 = Linear with flux optim.
P2.6.4 <sup>(1)</sup>	Field weakening point	8.00	320.00	Hz	50.00		602	

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.6.5 <sup>(1)</sup>	Voltage at field weakening point	10.00	200.00	%	100.00		603	
P2.6.6 <sup>(1)</sup>	U/f curve midpoint frequency	0.00	P2.6.4	Hz	50.00		604	
P2.6.7 <sup>(1)</sup>	U/f curve midpoint voltage	0.00	100.00	%	100.00		605	
P2.6.8 <sup>(1)</sup>	Output voltage at zero frequency	0.00	40.00	%	Varies		606	
P2.6.9	Switching frequency	1.0	Varies	kHz	Varies		601	
P2.6.10	Overvoltage controller	0	2		1		607	0 = Not used 1 = Used (no ramping) 2 = Used (ramping)
P2.6.11	Undervoltage controller	0	2		2		608	0 = Not used 1 = Used 2 = Used (ramping to zero)
P2.6.12	Load drooping	0.00	100.00	%	0.00		620	
P2.6.13	Identification	0	2/5		0		631	0 = No action 1 = Identification w/o run 2 = Identification with run  <b>Only VACON® NXP:</b> 3 = Encoder ID run 4 = No action 5 = ID Run Failed
<b>Closed Loop parameter group 2.6.14</b>								
P2.6.14.1	Magnetizing current	0.00	2 x I <sub>H</sub>	A	0.00		612	
P2.6.14.2	Speed control P gain	1	1000		30		613	
P2.6.14.3	Speed control I time	0.0	3200.0	ms	30.0		614	
P2.6.14.5	Acceleration compensation	0.00	300.00	s	0.00		626	
P2.6.14.6	Slip adjust	0	500	%	100		619	
P2.6.14.7	Magnetizing current at start	0.00	I <sub>L</sub>	A	0.00		627	
P2.6.14.8	Magnetizing time at start	0	60000	ms	0		628	
P2.6.14.9	0-speed time at start	0	32000	ms	100		615	
P2.6.14.10	0-speed time at stop	0	32000	ms	100		616	

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.6.14.11	Start-up torque	0	3		0		621	0 = Not used 1 = Torque memory 2 = Torque reference 3 = Start-up torque fwd/rev
P2.6.14.12	Start-up torque FWD	-300.0	300.0	%	0.0		633	
P2.6.14.13	Start-up torque REV	-300.0	300.0	%	0.0		634	
P2.6.14.15	Encoder filter time	0.0	100	ms	0.0		618	
P2.6.14.17	Current control P gain	0.00	100.00	%	40.00		617	
<b>Identification parameter group 2.6.15</b>								
P2.6.15.1	Speed step	-50.0	50.0		0.0		1252	

<sup>1</sup> Parameter value can only be changed after the AC drive has been stopped.

### 3.4.8 Protections (Control Panel: Menu M2 -> G2.7)

Table 12: Protections, G2.7

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.7.1	Response to 4 mA reference fault	0	5		0		700	0 = No response 1 = Warning 2 = Warning+Previous Freq. 3 = Wrng+Preset- Freq 2.7.2 4 = Fault, stop acc. to 2.4.7 5 = Fault, stop by coasting
P2.7.2	4 mA reference fault frequency	0.00	P2.1.2	Hz	0.00		728	
P2.7.3	Response to external fault	0	3		2		701	0 = No response
P2.7.4	Input phase supervision	0	3		0		730	1 = Warning 2 = Fault, stop acc. to 2.4.7 3 = Fault, stop by coasting
P2.7.5	Response to undervoltage fault	0	1		0		727	0 = Fault stored in history 1 = Fault not stored

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.7.6	Output phase supervision	0	3		2		702	0 = No response
P2.7.7	Earth fault protection	0	3		2		703	1 = Warning
P2.7.8	Thermal protection of the motor	0	3		2		704	2 = Fault, stop acc. to 2.4.7 3 = Fault, stop by coasting
P2.7.9	Motor ambient temperature factor	-100.0	100.0	%	0.0		705	
P2.7.10	Motor cooling factor at zero speed	0.0	150.0	%	40.0		706	
P2.7.11	Motor thermal time constant	1	200	min	Varies		707	
P2.7.12	Motor duty cycle	0	150	%	100		708	
P2.7.13	Stall protection	0	3		0		709	0 = No response 1 = Warning 2 = Fault, stop acc. to 2.4.7 3 = Fault, stop by coasting
P2.7.14	Stall current	0.00	2 x I <sub>H</sub>	A	I <sub>H</sub>		710	
P2.7.15	Stall time limit	1.00	120.00	s	15.00		711	
P2.7.16	Stall frequency limit	1.0	P2.1.2	Hz	25.00		712	
P2.7.17	Underload protection	0	3		0		713	0 = No response 1 = Warning 2 = Fault, stop acc. to 2.4.7 3 = Fault, stop by coasting
P2.7.18	UP From Torque	10.0	150.0	%	50.0		714	
P2.7.19	UP Zero frequency load	5.0	150.0	%	10.0		715	
P2.7.20	Underload protection time limit	2.00	600.00	s	20.00		716	
P2.7.21	Response to thermistor fault	0	3		2		732	0 = No response
P2.7.22	Response to fieldbus fault	0	3		2		733	1 = Warning
P2.7.23	Response to slot fault	0	3		2		734	2 = Fault, stop acc. to 2.4.7 3 = Fault, stop by coasting

### 3.4.9 Autorestart Parameters (Control Panel: Menu M2 -> G2.8)

**Table 13: Autorestart Parameters, G2.8**

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.8.1	Wait time	0.10	10.00	s	0.50		717	

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.8.2	Trial time	0.00	60.00	s	30.00		718	
P2.8.3	Start function	0	2		0		719	0 = Ramp 1 = Flying start 2 = According to P2.4.6
P2.8.4	Number of tries after undervoltage trip	0	10		0		720	
P2.8.5	Number of tries after overvoltage trip	0	10		0		721	
P2.8.6	Number of tries after overcurrent trip	0	3		0		722	
P2.8.7	Number of tries after 4mA reference trip	0	10		0		723	
P2.8.8	Number of tries after motor temperature fault trip	0	10		0		726	
P2.8.9	Number of tries after external fault trip	0	10		0		725	
P2.8.10	Number of tries after underload fault trip	0	10		0		738	

### 3.4.10 Keypad Control (Control Panel: Menu M3)

The parameters for the selection of control place and direction on the keypad are listed in this table. See the *Keypad control* menu in the User Manual of the product.

**Table 14: Keypad Control Parameters, M3**

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P3.1	Control place	1	3		1		125	1 = I/O terminal 2 = Keypad 3 = Fieldbus
P3.2	Keypad reference	P2.1.1	P2.1.2	Hz	0.00			
P3.3	Direction (on keypad)	0	1		0		123	0 = Forward 1 = Reverse
R3.4	Stop button	0	1		1		114	0 = Limited function of Stop button 1 = Stop button always enabled

### 3.4.11 System Menu (Control Panel: Menu M6)

For more information related to the general use of the AC drive, such as selecting application and language, customized parameter sets, or hardware and software, see the User Manual of the product.

### 3.4.12 Expander Boards (Control Panel: Menu M7)

The *M7* menu shows the expander and option boards attached to the control board and board-related information. For more information, see the User Manual of the product.

## 4 Local/Remote Control Application

### 4.1 Introduction to Local/Remote Control Application

Select the Local/Remote Control Application in menu *M6* on page *S6.2*.

With the Local/Remote Control Application, it is possible to have two different control places. For each control place the frequency reference can be selected from either the control panel, I/O terminal, or fieldbus. The active control place is selected with the digital input DIN 6.

- All outputs are freely programmable.

**Extra functions:**

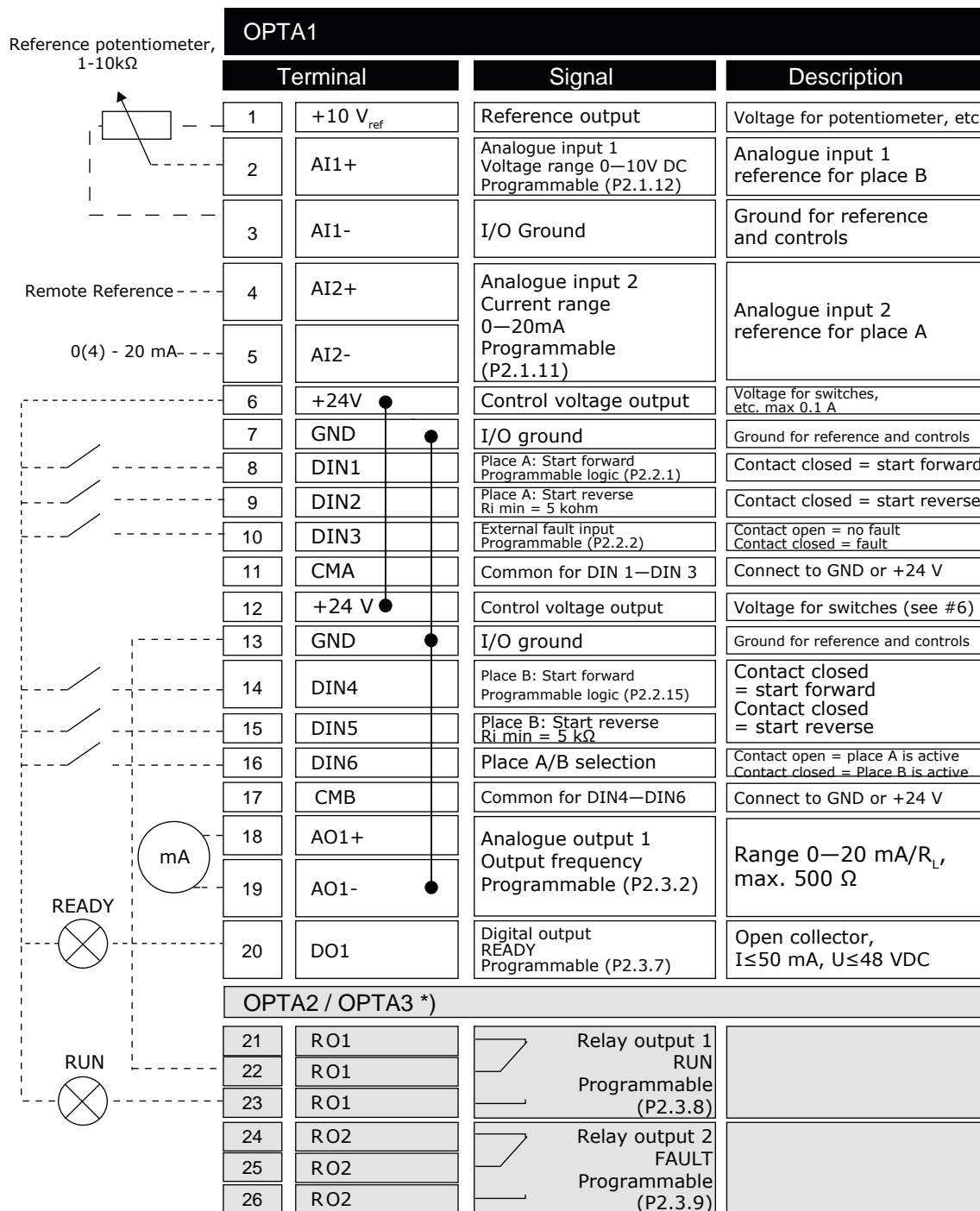
- Programmable Start/Stop and Reverse signal logic
- Reference scaling
- One frequency limit supervision
- Second ramps and S-shape ramp programming
- Programmable start and stop functions
- DC brake at stop
- One prohibit frequency area
- Programmable U/f curve and switching frequency
- Auto restart
- Motor thermal and stall protection: Programmable action; off, warning, fault

The parameters of the Local/Remote Control Application are explained in Chapter Parameter descriptions of this manual. The explanations are arranged according to the individual ID number of the parameter.



4.2 Control I/O in Local/Remote Control Application

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\* The option board A3 has no terminal for open contact on its second relay output (terminal 24 is missing).

Illustration 8: Default I/O Configuration in Local/Remote Control Application

See jumper selections in [illustration 12](#). More information in the User Manual of the product.

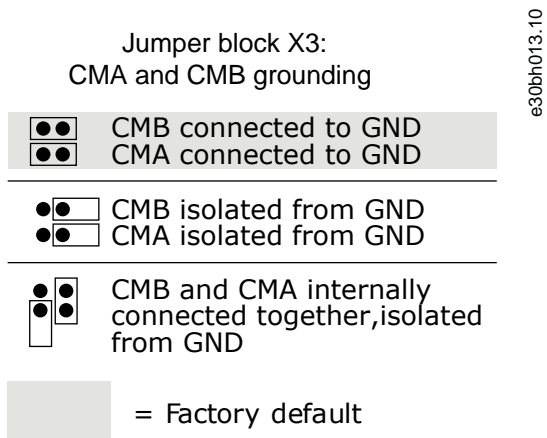
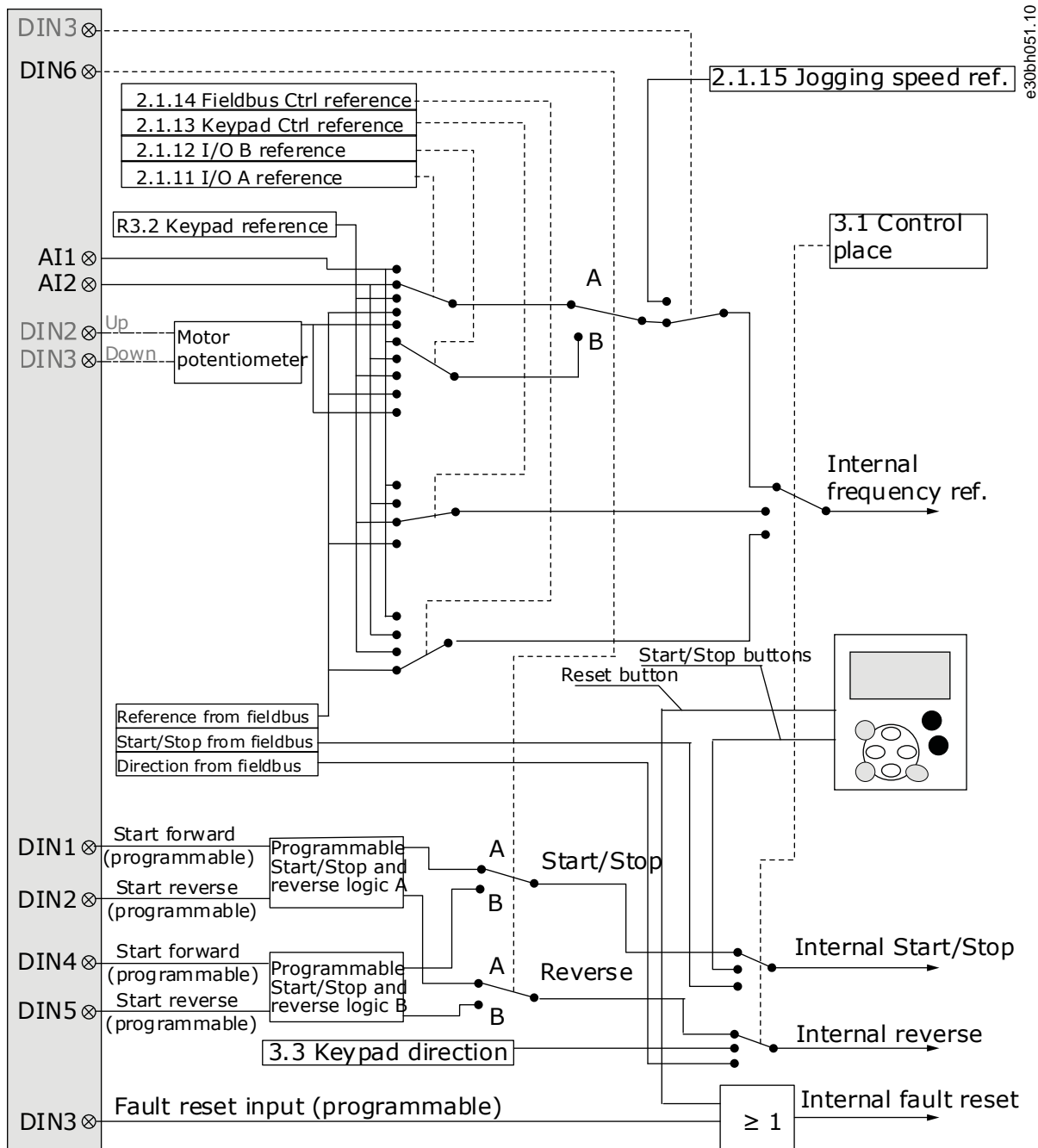


Illustration 9: Jumper Selections

4.3 Control Signal Logic in Local/Remote Control Application



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Illustration 10: Control Signal Logic of the Local/Remote Control Application

## 4.4 Parameter Lists for Local/Remote Control Application

### 4.4.1 Monitoring Values (Control Panel: Menu M1)

The monitoring values are the actual values of parameters and signals as well as statuses and measurements. Monitoring values cannot be edited.

**Table 15: Monitoring Values**

Index	Monitoring value	Unit	Form	ID	Description
V1.1	Output frequency	Hz	###	1	
V1.2	Frequency reference	Hz	###	25	
V1.3	Motor speed	RPM	#	2	
V1.4	Motor current	A	Varies	3	
V1.5	Motor torque	%	##	4	
V1.6	Motor shaft power	%	##	5	
V1.7	Motor voltage	V	##	6	
V1.8	DC-link voltage	V	#	7	
V1.9	Unit temperature	°C	#	8	
V1.10	Motor temperature	%	##	9	
V1.11	Analog input 1	V/mA	###	13	
V1.12	Analog input 2	V/mA	###	14	
V1.13	DIN 1, 2, 3			15	
V1.14	DIN 4, 5, 6			16	
V1.15	DO1, RO1, RO2			17	
V1.16	Analog I <sub>out</sub>	mA	###	26	
V1.17	Multimonitoring items				

### 4.4.2 Basic Parameters (Control Panel: Menu M2 -> G2.1)

**Table 16: Basic Parameters G2.1**

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.1.1	Min frequency	0.00	P2.1.2	Hz	0.00		101	
P2.1.2	Max frequency	P2.1.1	320.00	Hz	50.00		102	
P2.1.3	Acceleration time 1	0.1	3000.0	s	0.0		103	
P2.1.4	Deceleration time 1	0.1	3000.0	s	0.0		104	
P2.1.5	Current limit	0.1 x I <sub>H</sub>	2 x I <sub>H</sub>	A	I <sub>L</sub>		107	

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.1.6 <sup>(1)</sup>	Nominal voltage of the motor	180	690	V	NX2: 230 V NX5: 400 V NX6: 690 V		110	
P2.1.7 <sup>(1)</sup>	Nominal frequency of the motor	8.00	320.00	Hz	50.00		111	
P2.1.8 <sup>(1)</sup>	Nominal speed of the motor	24	20 000	RPM	1440		112	
P2.1.9 <sup>(1)</sup>	Nominal current of the motor	0.1 x I <sub>H</sub>	2 X I <sub>H</sub>	A	I <sub>H</sub>		113	
P2.1.10 <sup>(1)</sup>	Motor cos phi	0.30	1.00		0.85		120	
P2.1.11 <sup>(1)</sup>	I/O A reference	0	4		1		117	0 = AI1 1 = AI2 2 = Keypad 3 = Fieldbus 4 = Motor potentiometer
P2.1.12 <sup>(1)</sup>	I/O B reference	0	4		0		131	0 = AI1 1 = AI2 2 = Keypad 3 = Fieldbus 4 = Motor potentiometer
P2.1.13 <sup>(1)</sup>	Keypad control reference	0	3		2		121	0 = AI1 1 = AI2 2 = Keypad 3 = Fieldbus
P2.1.14 <sup>(1)</sup>	Fieldbus control reference	0	3		3		122	0 = AI1 1 = AI2 2 = Keypad 3 = Fieldbus
P2.1.15 <sup>(1)</sup>	Jogging speed reference	0.00	P2.1.2	Hz	0.00		124	

<sup>1</sup> Parameter value can only be changed after the AC drive has been stopped.

### 4.4.3 Input Signals (Control Panel: Menu M2 -> G2.2)

Table 17: Input Signals, G2.2

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.2.1 <sup>(1)</sup>	Place A Start/Stop logic selection	0	8		0		300	<p><b>Logic = 0</b></p> <p>Ctrl sgn 1 = Start forward</p> <p>Ctrl sgn 2 = Start reverse</p> <p><b>Logic = 1</b></p> <p>Ctrl sgn1 = Start/ Stop</p> <p>Ctrl sgn 2 = Reverse</p> <p><b>Logic = 2</b></p> <p>Ctrl sgn 1 = Start/ Stop</p> <p>Ctrl sgn 2 = Run enable</p> <p><b>Logic = 3</b></p> <p>Ctrl sgn 1 = Start pulse (edge)</p> <p>Ctrl sgn 2 = Stop pulse</p> <p><b>Logic = 4</b></p> <p>Ctrl sgn 1 = Start Forward</p> <p>Ctrl sgn 2 = Motor potentiometer UP</p> <p><b>Logic = 5</b></p> <p>Ctrl sgn 1 = Start forward (edge)</p> <p>Ctrl sgn 2 = Start reverse (edge)</p> <p><b>Logic = 6</b></p> <p>Ctrl sgn 1 = Start (edge) / Stop</p> <p>Ctrl sgn 2 = Reverse</p> <p><b>Logic = 7</b></p> <p>Ctrl sgn 1 = Start (edge) / Stop</p> <p>Ctrl sgn 2 = Run enable</p> <p><b>Logic = 8</b></p> <p>Ctrl sgn 1 = Start forward (edge)</p> <p>Ctrl sgn 2 = Motor potentiometer UP</p>

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.2.2	DIN 3 function	0	13		1		301	0 = Not used 1 = Ext. fault, closing cont. 2 = Ext. fault, opening cont. 3 = Run enable 4 = Acc./Dec. time selection 5 = Force cp. to IO 6 = Force cp. to keypad 7 = Force cp. to fieldbus 8 = Reverse 9 = Jogging speed 10 = Fault reset 11 = Acc./Dec. operation prohibit 12 = DC Braking command 13 = Motor potentiometer DOWN
P2.2.3 <sup>(2)</sup>	AI1 signal selection	0.1	E.10		A1		377	
P2.2.4 <sup>(3)</sup>	AI1 signal range	0	2		0		320	0 = 0–10 V (0–20 mA) 1 = 2–10 V (4–20 mA) 2 = Custom setting range
P2.2.5	AI1 custom setting minimum	-160.00	160.00	%	0.00		321	
P2.2.6	AI1 custom setting maximum	-160.00	160.00	%	0.00		322	
P2.2.7	AI1 signal inversion	0	1		0		323	0 = Not inverted 1 = Inverted
P2.2.8	AI1 signal filter time	0.00	10.00	s	A1		324	
P2.2.9 <sup>(2)</sup>	AI2 signal selection	0.1	E.10		A.2		388	
P2.2.10 <sup>(3)</sup>	AI2 signal range	0	2		1		325	0 = 0–10 V (0–20 mA) 1 = 2–10 V (4–20 mA) 2 = Custom setting range
P2.2.11	AI2 custom setting minimum	-160.00	160.00	%	0.00		326	

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.2.12	AI2 custom setting maximum	-160.00	160.00	%	100.00		327	
P2.2.13	AI2 signal inversion	0	1		0		328	0 = Not inverted 1 = Inverted
P2.2.14	AI2 signal filter time	0.00	10.00	s	0.10		329	
P2.2.15 <sup>(1)</sup>	Place B Start/Stop logic selection	0	6		0		363	<p><b>Logic = 0</b></p> <p>Ctrl sgn 1 = Start forward</p> <p>Ctrl sgn 2 = Start reverse</p> <p><b>Logic = 1</b></p> <p>Ctrl sgn 1 = Start/ Stop</p> <p>Ctrl sgn 2 = Reverse</p> <p><b>Logic = 2</b></p> <p>Ctrl sgn 1 = Start/ Stop</p> <p>Ctrl sgn 2 = Run enable</p> <p><b>Logic = 3</b></p> <p>Ctrl sgn 1 = Start pulse (edge)</p> <p>Ctrl sgn 2 = Stop pulse</p> <p><b>Logic = 4</b></p> <p>Ctrl sgn 1 = Forward pulse (edge)</p> <p>Ctrl sgn 2 = Reverse pulse (edge)</p> <p><b>Logic = 5</b></p> <p>Ctrl sgn 1 = Start pulse (edge)</p> <p>Ctrl sgn 2 = Reverse pulse</p> <p><b>Logic = 6</b></p> <p>Ctrl sgn 1 = Start pulse (edge)</p> <p>Ctrl sgn 2 = Enable pulse</p>
P2.2.16	Place A Reference scaling minimum value	0.00	320.00	Hz	0.00		303	
P2.2.17	Place A Reference scaling maximum value	0.00					304	



Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.2.18	Place B Reference scaling minimum value	0.00	320.00	Hz	0.00		364	
P2.2.19	Place B Reference scaling maximum value	0.00	320.00	Hz	0.00		365	0.00 = No scaling >0 = scaled max. value
P2.2.20	Free analog input, signal selection	0	2		0		361	0 = Not used 1 = Analog input 1 2 = Analog input 2
P2.2.21	Free analog input, function	0	4		0		362	0 = No reset 1 = Reduces current limit (P2.1.5) 2 = Reduces DC braking current 3 = Reduces accel. and decel. times 4 = Reduces torque supervision limit
P2.2.22	Motor potentiometer ramp time	0.1	2000.0	Hz/s	10.0		331	
P2.2.23	Motor potentiometer frequency reference memory reset	0	2		1		367	0 = No reset 1 = Reset if stopped or powered down 2 = Reset if powered down
P2.2.24	Start pulse memory	0	1		0		498	0 = Run state not copied 1 = Run state copied

<sup>1</sup> Parameter value can only be changed after the AC drive has been stopped.

<sup>2</sup> Use TTF method to program these parameters, see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#).

<sup>3</sup> Remember to place jumpers of block X2 according to the selection (0, 1 or 2). See the User Manual of the product.

#### 4.4.4 Output Signals (Control Panel: Menu M2 -> G2.3)

Table 18: Output Signals, G2.3

Index	Parameter	Min	Max	Unit	De- fault	Cust	ID	Description
P2.3.1 <sup>(1)</sup>	Analog output 1 signal selection	0.1	E.10		A11		464	

Index	Parameter	Min	Max	Unit	De- fault	Cust	ID	Description
P2.3.2	Analog output function	0	8		1		307	0 = Not used (20 mA/10V) 1 = Output freq. (0- $f_{max}$ ) 2 = Freq. reference (0- $f_{max}$ ) 3 = Motor speed (0-Motor nominal speed) 4 = Motor current (0- $I_{nMotor}$ ) 5 = Motor torque (0- $T_{nMotor}$ ) 6 = Motor power (0- $P_{nMotor}$ ) 7 = Motor voltage (0- $U_{nMotor}$ ) 8 = DC-link volt (0-1000V)
P2.3.3	Analog output filter time	0.00	10.00	s	1.00		308	0 = No filtering
P2.3.4	Analog output inversion	0	1		0		309	0 = Not inverted 1 = Inverted
P2.3.5	Analog output minimum	0	1		0		310	0 = 0 mA (0 V) 1 = 4 mA (2 V)
P2.3.6	Analog output scale	10	1000	%	100		311	

Index	Parameter	Min	Max	Unit	De- fault	Cust	ID	Description
P2.3.7	Digital output 1 function	0	22		1		312	0 = Not used
P2.3.8	RO1 function	0	22		2		313	1 = Ready
P2.3.9	RO2 function	0	22		3		314	2 = Run 3 = Fault 4 = Fault inverted 5 = AC drive overheat warning 6 = Ext. fault or warning 7 = Ref. fault or warning 8 = Warning 9 = Reversed 10 = Jogging speed selected 11 = At speed 12 = Mot. regulator active 13 = OP freq. limit 1 superv. 14 = OP freq. limit superv.2 15 = Torque limit superv. 16 = Ref. limit superv. 17 = Ext. brake control 18 = Control place: IO 19 = AC drive temp. limit superv. 20 = Unrequested rotation direction 21 = Ext. brake control inverted 22 = Thermistor fault/warn.
P2.3.10	Output frequency limit 1 supervision	0	2		0		315	0 = No limit 1 = Low limit supervision 2 = High limit supervision
P2.3.11	Output frequency limit 1; Supervised value	0.00	320.00	Hz	0.00		316	

Index	Parameter	Min	Max	Unit	De- fault	Cust	ID	Description
P2.3.12	Output frequency limit 2 supervision	0	2		0		346	0 = No limit 1 = Low limit supervision 2 = High limit supervision
P2.3.13	Output frequency limit 2; Supervision value	0.00	320.00	Hz	0.00		347	
P2.3.14	Torque limit supervision function	0	2		0		348	0 = No 1 = Low limit 2 = High limit
P2.3.15	Torque limit supervision value	-300.0	300.0	%	0.0		349	
P2.3.16	Reference limit supervision function	0	2		0		350	0 = No 1 = Low limit 2 = High limit
P2.3.17	Reference limit supervision value	0.0	100.0	%	0.0		351	
P2.3.18	External brake Off-delay	0.0	100.0	s	0.5		352	
P2.3.19	External brake On-delay	0.0	100.0	s	1.5		353	
P2.3.20	Frequency converter temperature limit supervision	0	2		0		354	0 = No 1 = Low limit 2 = High limit
P2.3.21	Frequency converter temperature limit value	-10	100	°C	40		355	
P2.3.22	Analog output 2 scaling	0.1	E.10		0.1		471	
P2.3.23	Analog output 2 function	0	8		4		472	As parameter 2.3.2
P2.3.24	Analog output 2 filter time	0.00	10.00	s	1.00		473	0 = No filtering
P2.3.25	Analog output 2 inversion	0	1		0		474	0 = Not inverted 1 = Inverted
P2.3.26	Analog output 2 minimum	0	1		0		475	0 = 0 mA (0 V) 1 = 4 mA (2 V)
P2.3.27	Analog output 2 scaling	10	1000	%	1.00		476	

<sup>1</sup> Use TTF method to program these parameters, see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#).

#### 4.4.5 Drive Control Parameters (Control Panel: Menu M2->G2.4)

**Table 19: Drive Control Parameters, G2.4**

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.4.1	Ramp 1 shape	0.0	10.0	s	0.1		500	0 = Linear 100 = full acc/dec inc/dec times
P2.4.2	Ramp 2 shape	0.0	10.0	s	0.0		501	0 = Linear 100 = full acc/dec inc/dec times
P2.4.3	Acceleration time 2	0.1	3000.0	s	1.0		502	
P2.4.4	Deceleration time 2	0.1	3000.0	s	1.0		503	
P2.4.5	Brake chopper	0	4		0		504	0 = Disabled 1 = Used when running 2 = External brake chopper 3 = Used when stopped/running 4 = Used when running (no testing)
P2.4.6	Start function	0	2		0		505	0 = Ramp 1 = Flying start 2 = Conditional flying start
P2.4.7	Stop function	0	3		0		506	0 = Coasting 1 = Ramp 2 = Ramp+Run enable coast 3 = Coast+Run enable ramp
P2.4.8	DC braking current	0.00	$I_L$	A	$0.7 \times I_H$		507	
P2.4.9	DC braking time at stop	0.00	600.00	s	0.00		508	0 = DC brake is off at stop
P2.4.10	Frequency to start DC braking during ramp stop	0.10	10.00	Hz	1.50		515	
P2.4.11	DC braking time at start	0.00	600.00	s	0.00		516	0 = DC brake is off at start
P2.4.12	Flux brake	0	1		0		520	0 = Off 1 = On
P2.4.13	Flux braking current	0.00	$I_L$	A	$I_H$		519	

#### 4.4.6 Prohibit Frequency Parameters (Control Panel: Menu M2 -> G2.5)

Table 20: Prohibit Frequency Parameters, G2.5

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.5.1	Prohibit frequency range 1 low limit	0.00	320.00	Hz	0.00		509	
P2.5.2	Prohibit frequency range 1 high limit	0.00	320.00	Hz	0.00		510	0 = Prohibit range 1 is off
P2.5.3	Prohibit frequency range 2 low limit	0.00	320.00	Hz	0.00		511	
P2.5.4	Prohibit frequency range 2 high limit	0.00	320.00	Hz	0.00		512	0 = Prohibit range 2 is off
P2.5.5	Prohibit frequency range 3 low limit	0.00	320.00	Hz	0.00		513	
P2.5.6	Prohibit frequency range 3 high limit	0.00	320.00	Hz	0.00		514	0 = Prohibit range 3 is off
P2.5.7	Prohibit acc./dec. ramp	0.1	10.0	x	1.0		518	

#### 4.4.7 Motor Control Parameters (Control Panel: Menu M2 -> G2.6)

Table 21: Motor Control Parameters, G2.6

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.6.1 <sup>(1)</sup>	Motor control mode	0	1/4		0		600	0 = Frequency control 1 = Speed control <b>VACON® NXP:</b> 2 = Open loop torque control 3 = Closed loop speed ctrl 4 = Closed loop torque control
P2.6.2 <sup>(1)</sup>	U/f optimisation	0	1		0		109	0 = Not used 1 = Automatic torque boost
P2.6.3 <sup>(1)</sup>	U/f ratio selection	0	3		0		108	0 = Linear 1 = Squared 2 = Programmable 3 = Linear with flux optim.
P2.6.4 <sup>(1)</sup>	Field weakening point	8.00	320.00	Hz	50.00		602	
P2.6.5 <sup>(1)</sup>	Voltage at field weakening point	10.00	200.00	%	100.00		603	
P2.6.6 <sup>(1)</sup>	U/f curve midpoint frequency	0.00	P2.6.4	Hz	50.00		604	
P2.6.7 <sup>(1)</sup>	U/f curve midpoint voltage	0.00	100.00	%	100.00		605	
P2.6.8 <sup>(1)</sup>	Output voltage at zero frequency	0.00	40.00	%	Varies		606	

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.6.9	Switching frequency	1.0	Varies	kHz	Varies		601	
P2.6.10	Overvoltage controller	0	2		1		607	0 = Not used 1 = Used (no ramping) 2 = Used (ramping)
P2.6.11	Undervoltage controller	0	2		2		608	0 = Not used 1 = Used 2 = Used (ramping to zero)
P2.6.12	Load drooping	0.00	100.00	%	0.00		620	
P2.6.13	Identification	0	2/5		0		631	0 = No action 1 = Identification w/o run 2 = Identification with run  <b>Only VACON® NXP:</b> 3 = Encoder ID run 4 = No action 5 = ID Run Failed
<b>Closed Loop parameter group 2.6.14</b>								
P2.6.14.1	Magnetizing current	0.00	2 x I <sub>H</sub>	A	0.00		612	
P2.6.14.2	Speed control P gain	1	1000		30		613	
P2.6.14.3	Speed control I time	0.0	3200.0	ms	30.0		614	
P2.6.14.5	Acceleration compensation	0.00	300.00	s	0.00		626	
P2.6.14.6	Slip adjust	0	500	%	100		619	
P2.6.14.7	Magnetizing current at start	0.00	I <sub>L</sub>	A	0.00		627	
P2.6.14.8	Magnetizing time at start	0	60000	ms	0		628	
P2.6.14.9	0-speed time at start	0	32000	ms	100		615	
P2.6.14.10	0-speed time at stop	0	32000	ms	100		616	
P2.6.14.11	Start-up torque	0	3		0		621	0 = Not used 1 = Torque memory 2 = Torque reference 3 = Start-up torque fwd/rev
P2.6.14.12	Start-up torque FWD	-300.0	300.0	%	0.0		633	
P2.6.14.13	Start-up torque REV	-300.0	300.0	%	0.0		634	

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.6.14.15	Encoder filter time	0.0	100	ms	0.0		618	
P2.6.14.17	Current control P gain	0.00	100.00	%	40.00		617	
<b>Identification parameter group 2.6.15</b>								
P2.6.15.1	Speed step	-50.0	50.0		0.0		1252	

#### 4.4.8 Protections (Control Panel: Menu M2 -> G2.7)

Table 22: Protections, G2.7

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.7.1	Response to 4 mA reference fault	0	5		0		700	0 = No response 1 = Warning 2 = Warning+Previous Freq. 3 = Wrng+Preset- Freq 2.7.2 4 = Fault, stop acc. to 2.4.7 5 = Fault, stop by coasting
P2.7.2	4 mA reference fault frequency	0.00	P2.1.2	Hz	0.00		728	
P2.7.3	Response to external fault	0	3		2		701	0 = No response
P2.7.4	Input phase supervision	0	3		0		730	1 = Warning 2 = Fault, stop acc. to 2.4.7 3 = Fault, stop by coasting
P2.7.5	Response to undervoltage fault	0	1		0		727	0 = Fault stored in history 1 = Fault not stored
P2.7.6	Output phase supervision	0	3		2		702	0 = No response
P2.7.7	Earth fault protection	0	3		2		703	1 = Warning
P2.7.8	Thermal protection of the motor	0	3		2		704	2 = Fault, stop acc. to 2.4.7 3 = Fault, stop by coasting
P2.7.9	Motor ambient temperature factor	-100.0	100.0	%	0.0		705	
P2.7.10	Motor cooling factor at zero speed	0.0	150.0	%	40.0		706	
P2.7.11	Motor thermal time constant	1	200	min	Varies		707	
P2.7.12	Motor duty cycle	0	150	%	100		708	



Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.7.13	Stall protection	0	3		0		709	0 = No response 1 = Warning 2 = Fault, stop acc. to 2.4.7 3 = Fault, stop by coasting
P2.7.14	Stall current	0.00	2 x I <sub>H</sub>	A	I <sub>H</sub>		710	
P2.7.15	Stall time limit	1.00	120.00	s	15.00		711	
P2.7.16	Stall frequency limit	1.0	P2.1.2	Hz	25.00		712	
P2.7.17	Underload protection	0	3		0		713	0 = No response 1 = Warning 2 = Fault, stop acc. to 2.4.7 3 = Fault, stop by coasting
P2.7.18	UP From Torque	10.0	150.0	%	50.0		714	
P2.7.19	UP Zero frequency load	5.0	150.0	%	10.0		715	
P2.7.20	Underload protection time limit	2.00	600.00	s	20.00		716	
P2.7.21	Response to thermistor fault	0	3		2		732	0 = No response
P2.7.22	Response to fieldbus fault	0	3		2		733	1 = Warning
P2.7.23	Response to slot fault	0	3		2		734	2 = Fault, stop acc. to 2.4.7 3 = Fault, stop by coasting

#### 4.4.9 Autorestart Parameters (Control Panel: Menu M2 -> G2.8)

Table 23: Autorestart Parameters, G2.8

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.8.1	Wait time	0.10	10.00	s	0.50		717	
P2.8.2	Trial time	0.00	60.00	s	30.00		718	
P2.8.3	Start function	0	2		0		719	0 = Ramp 1 = Flying start 2 = According to P2.4.6
P2.8.4	Number of tries after undervoltage trip	0	10		0		720	
P2.8.5	Number of tries after overvoltage trip	0	10		0		721	
P2.8.6	Number of tries after overcurrent trip	0	3		0		722	
P2.8.7	Number of tries after 4mA reference trip	0	10		0		723	

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.8.8	Number of tries after motor temperature fault trip	0	10		0		726	
P2.8.9	Number of tries after external fault trip	0	10		0		725	
P2.8.10	Number of tries after underload fault trip	0	10		0		738	

#### 4.4.10 Keypad Control (Control Panel: Menu M3)

The parameters for the selection of control place and direction on the keypad are listed in this table. See the *Keypad control* menu in the User Manual of the product.

**Table 24: Keypad Control Parameters, M3**

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P3.1	Control place	1	3		1		125	1 = I/O terminal 2 = Keypad 3 = Fieldbus
P3.2	Keypad reference	P2.1.1	P2.1.2	Hz	0.00			
P3.3	Direction (on keypad)	0	1		0		123	0 = Forward 1 = Reverse
R3.4	Stop button	0	1		1		114	0 = Limited function of Stop button 1 = Stop button always enabled

#### 4.4.11 System Menu (Control Panel: Menu M6)

For more information related to the general use of the AC drive, such as selecting application and language, customized parameter sets, or hardware and software, see the User Manual of the product.

#### 4.4.12 Expander Boards (Control Panel: Menu M7)

The *M7* menu shows the expander and option boards attached to the control board and board-related information. For more information, see the User Manual of the product.

## 5 Multi-step Speed Control Application

### 5.1 Introduction to Multi-step Speed Control Application

Select the Multi-step Speed Control Application in menu *M6* on page *S6.2*.

The Multi-step Speed Control Application can be used in applications where fixed speeds are needed. In total, 15 + 2 different speeds can be programmed: 1 basic speed, 15 multi-step speeds, and 1 jogging speed. The speed steps are selected with digital signals DIN 3, DIN 4, DIN 5, and DIN 6. If jogging speed is used, DIN 3 can be programmed from fault reset to jogging speed select.

The basic speed reference can be either voltage or current signal via analog input terminals (2/ 3 or 4/5). The other one of the analog inputs can be programmed for other purposes.

- All outputs are freely programmable.

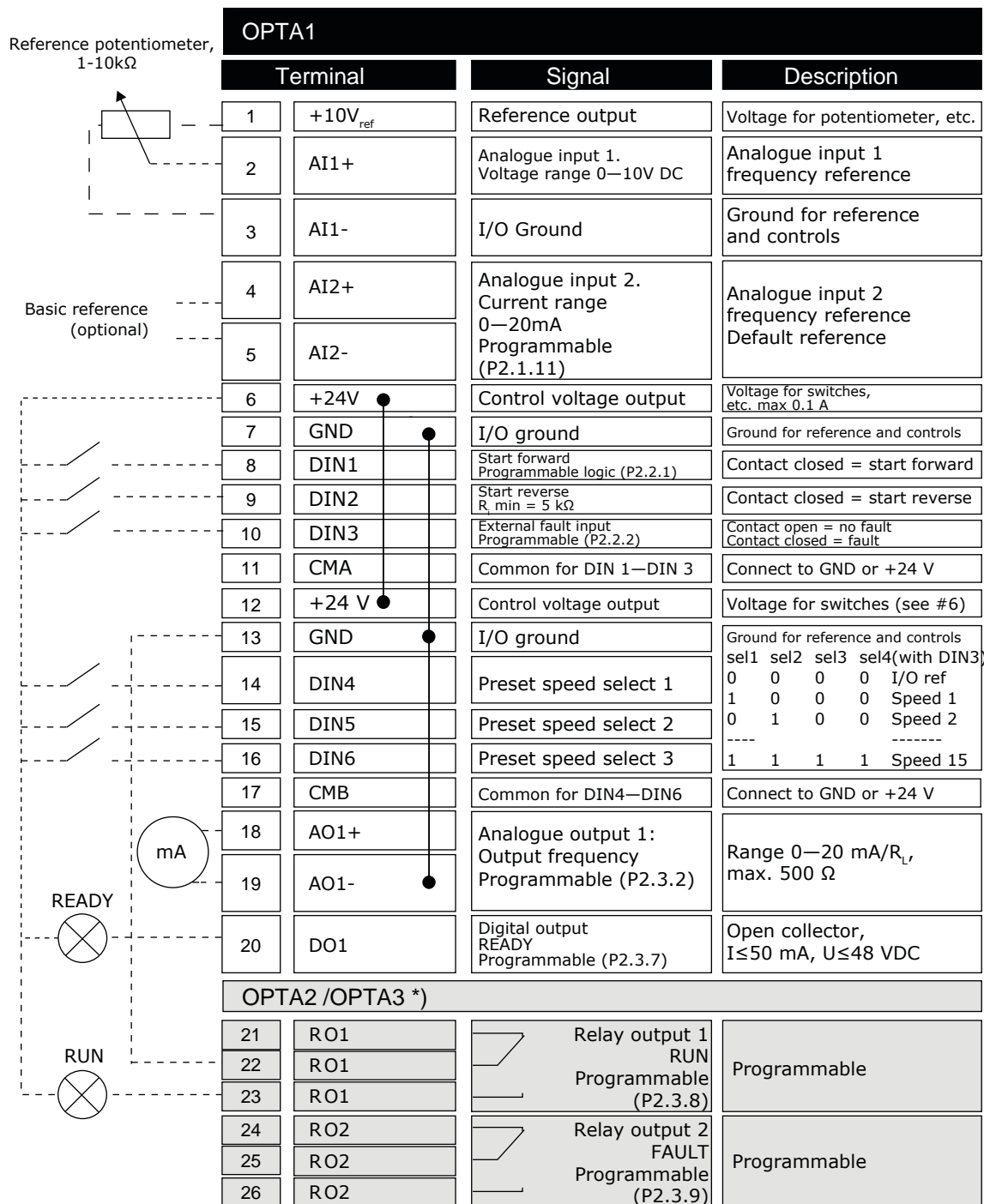
#### Extra functions:

- Programmable Start/Stop and Reverse signal logic
- Reference scaling
- One frequency limit supervision
- Second ramps and S-shape ramp programming
- Programmable start and stop functions
- DC brake at stop
- One prohibit frequency area
- Programmable U/f curve and switching frequency
- Auto restart
- Motor thermal and stall protection: Programmable action; off, warning, fault

The parameters of the Multi-step Speed Control Application are explained in Chapter Parameter descriptions of this manual. The explanations are arranged according to the individual ID number of the parameter.

5.2 Control I/O in Multi-step Speed Control

e30bh093.10



\* The option board A3 has no terminal for open contact on its second relay output (terminal 24 is missing).

Illustration 11: Default I/O Configuration in Multi-step Speed Control Application

See jumper selections in [illustration 12](#). More information in the User Manual of the product.

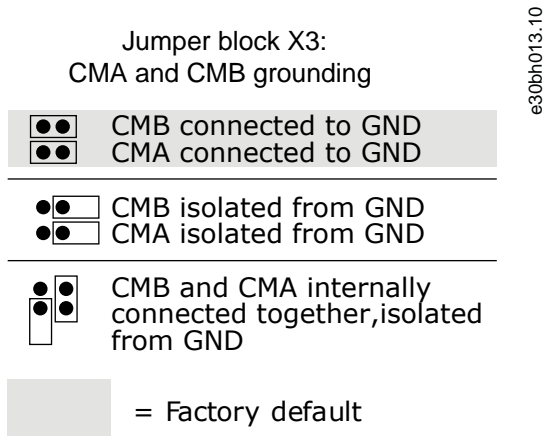


Illustration 12: Jumper Selections

### 5.3 Control Signal Logic in Multi-step Speed Control Application

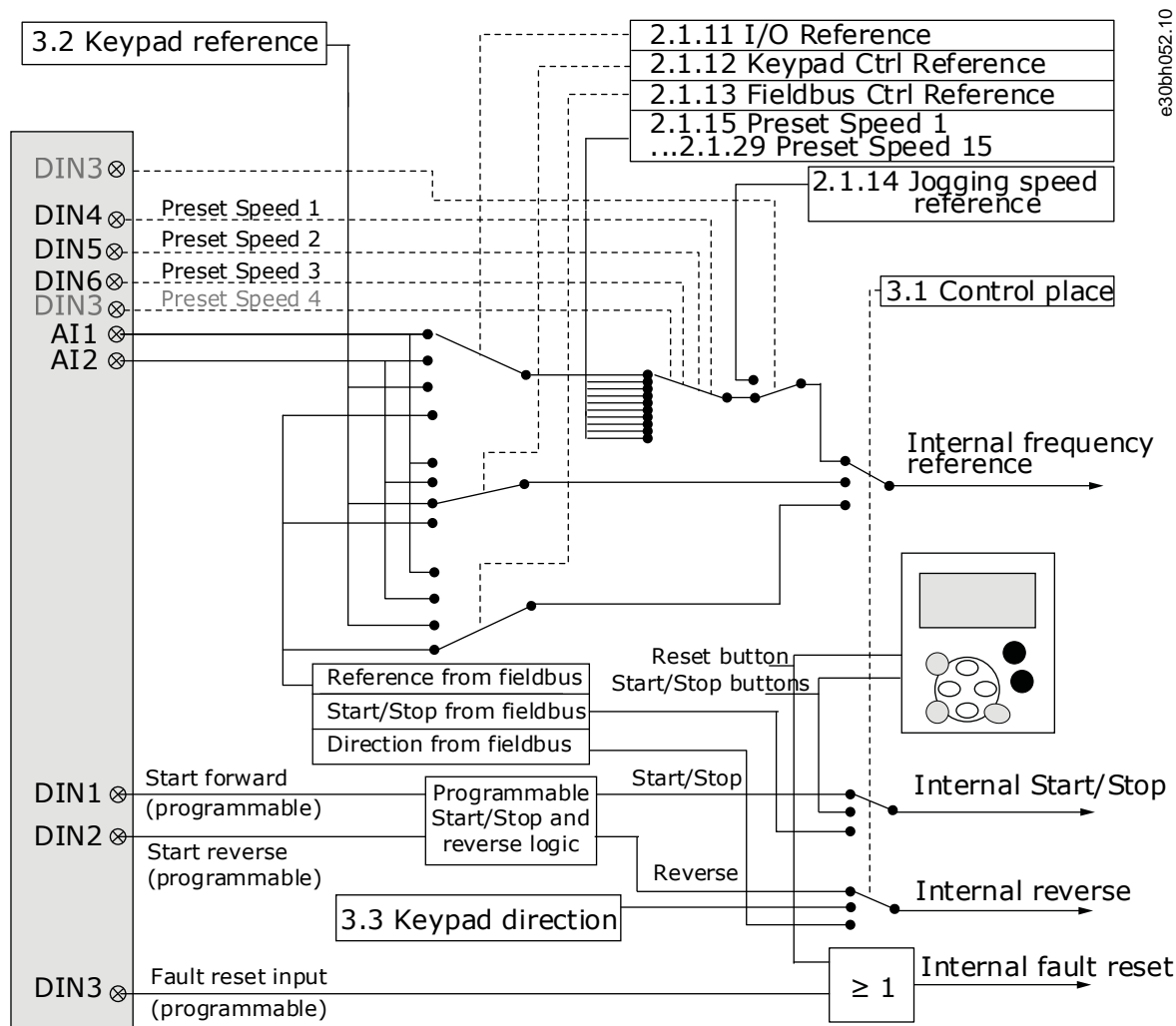


Illustration 13: Control Signal Logic of the Multi-step Speed Control Application

### 5.4 Parameter Lists for Multi-step Speed Control Application

#### 5.4.1 Monitoring Values (Control Panel: Menu M1)

The monitoring values are the actual values of parameters and signals as well as statuses and measurements. Monitoring values cannot be edited.

Table 25: Monitoring Values

Index	Monitoring value	Unit	Form	ID	Description
V1.1	Output frequency	Hz	###	1	
V1.2	Frequency reference	Hz	###	25	
V1.3	Motor speed	RPM	#	2	

Index	Monitoring value	Unit	Form	ID	Description
V1.4	Motor current	A	Varies	3	
V1.5	Motor torque	%	##	4	
V1.6	Motor shaft power	%	##	5	
V1.7	Motor voltage	V	##	6	
V1.8	DC-link voltage	V	#	7	
V1.9	Unit temperature	°C	#	8	
V1.10	Motor temperature	%	##	9	
V1.11	Analog input 1	V/mA	###	13	
V1.12	Analog input 2	V/mA	###	14	
V1.13	DIN 1, 2, 3			15	
V1.14	DIN 4, 5, 6			16	
V1.15	DO1, RO1, RO2			17	
V1.16	Analog I <sub>out</sub>	mA	###	26	
V1.17	Multimonitoring items				

## 5.4.2 Basic Parameters (Control Panel: Menu M2 -> G2.1)

Table 26: Basic Parameters G2.1

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.1.1	Min frequency	0.00	P2.1.2	Hz	0.00		101	
P2.1.2	Max frequency	P2.1.1	320.00	Hz	50.00		102	
P2.1.3	Acceleration time 1	0.1	3000.0	s	0.0		103	
P2.1.4	Deceleration time 1	0.1	3000.0	s	0.0		104	
P2.1.5	Current limit	0.1 x I <sub>H</sub>	2 x I <sub>H</sub>	A	I <sub>L</sub>		107	
P2.1.6 <sup>(1)</sup>	Nominal voltage of the motor	180	690	V	NX2: 230 V NX5: 400 V NX6: 690 V		110	
P2.1.7 <sup>(1)</sup>	Nominal frequency of the motor	8.00	320.00	Hz	50.00		111	
P2.1.8 <sup>(1)</sup>	Nominal speed of the motor	24	20 000	RPM	1440		112	
P2.1.9 <sup>(1)</sup>	Nominal current of the motor	0.1 x I <sub>H</sub>	2 X I <sub>H</sub>	A	I <sub>H</sub>		113	
P2.1.10 <sup>(1)</sup>	Motor cos phi	0.30	1.00		0.85		120	

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.1.11 <sup>(1)</sup>	I/O reference	0	3		1		117	0 = AI1
P2.1.12 <sup>(1)</sup>	Keypad control reference	0	3		2		121	1 = AI2
P2.1.13 <sup>(1)</sup>	Fieldbus control reference	0	3		3		122	2 = Keypad 3 = Fieldbus
P2.1.14	Jogging speed reference	0.00	P2.1.2	Hz	0.00		124	
P2.1.15	Preset speed 1	0.00	P2.1.2	Hz	5.00		105	
P2.1.16	Preset speed 2	0.00	P2.1.2	Hz	10.00		106	
P2.1.17	Preset speed 3	0.00	P2.1.2	Hz	12.50		126	
P2.1.18	Preset speed 4	0.00	P2.1.2	Hz	15.00		127	
P2.1.19	Preset speed 5	0.00	P2.1.2	Hz	17.50		128	
P2.1.20	Preset speed 6	0.00	P2.1.2	Hz	20.00		129	
P2.1.21	Preset speed 7	0.00	P2.1.2	Hz	22.50		130	
P2.1.22	Preset speed 8	0.00	P2.1.2	Hz	25.00		133	
P2.1.23	Preset speed 9	0.00	P2.1.2	Hz	27.50		134	
P2.1.24	Preset speed 10	0.00	P2.1.2	Hz	30.00		135	
P2.1.25	Preset speed 11	0.00	P2.1.2	Hz	32.50		136	
P2.1.26	Preset speed 12	0.00	P2.1.2	Hz	35.00		137	
P2.1.27	Preset speed 13	0.00	P2.1.2	Hz	40.00		138	
P2.1.28	Preset speed 14	0.00	P2.1.2	Hz	45.00		139	
P2.1.29	Preset speed 15	0.00	P2.1.2	Hz	50.00		140	

<sup>1</sup> Parameter value can only be changed after the AC drive has been stopped.



### 5.4.3 Input Signals (Control Panel: Menu M2 -> G2.2)

Table 27: Input Signals, G2.2

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.2.1 <sup>(1)</sup>	Place A Start/Stop logic selection	0	6		0		300	<p><b>Logic = 0</b></p> <p>Ctrl sgn 1 = Start forward</p> <p>Ctrl sgn 2 = Start reverse</p> <p><b>Logic = 1</b></p> <p>Ctrl sgn1 = Start/ Stop</p> <p>Ctrl sgn 2 = Reverse</p> <p><b>Logic = 2</b></p> <p>Ctrl sgn 1 = Start/ Stop</p> <p>Ctrl sgn 2 = Run enable</p> <p><b>Logic = 3</b></p> <p>Ctrl sgn 1 = Start pulse (edge)</p> <p>Ctrl sgn 2 = Stop pulse</p> <p><b>Logic = 4</b></p> <p>Ctrl sgn 1 = Forward pulse (edge)</p> <p>Ctrl sgn 2 = Reverse pulse (edge)</p> <p><b>Logic = 5</b></p> <p>Ctrl sgn 1 = Start pulse (edge)</p> <p>Ctrl sgn 2 = Reverse pulse</p> <p><b>Logic = 6</b></p> <p>Ctrl sgn 1 = Start pulse (edge)</p> <p>Ctrl sgn 2 = Enable pulse</p>

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.2.2	DIN 3 function	0	13		1		301	0 = Not used 1 = Ext. fault, closing cont. 2 = Ext. fault, opening cont. 3 = Run enable 4 = Acc./Dec. time select. 5 = Force cp. to IO 6 = Force cp. to keypad 7 = Force cp. to fieldbus 8 = Rvs (if P2.2.1 ≠ 2,3 or 6) 9 = Jogging speed 10 = Fault reset 11 = Acc./Dec. operation prohibit 12 = DC Braking command 13 = Preset speed
P2.2.3 <sup>(2)</sup>	AI1 signal selection	0.1	E.10		A1		377	
P2.2.4 <sup>(3)</sup>	AI1 signal range	0	2		0		320	0 = 0–10V (0–20 mA) 1 = 2–10 V (4–20 mA) 2 = Custom setting range
P2.2.5	AI1 custom setting minimum	-160.00	160.00	%	0.00		321	
P2.2.6	AI1 custom setting maximum	-160.00	160.00	%	100.00		322	
P2.2.7	AI1 signal inversion	0	1		0		323	0 = Not inverted 1 = Inverted
P2.2.8	AI1 signal filter time	0.00	10.00	s	0.10		324	
P2.2.9 <sup>(2)</sup>	AI2 signal selection	0.1	E.10		A.2		388	
P2.2.10 <sup>(3)</sup>	AI2 signal range	0	2		1		325	0 = 0–10 V (0–20 mA) 1 = 2–10 V (4–20 mA) 2 = Custom setting range

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.2.11	AI2 custom setting minimum	-160.00	160.00	%	0.00		326	
P2.2.12	AI2 custom setting maximum	-160.00	160.00	%	100.00		327	
P2.2.13	AI2 signal inversion	0	1		0		328	0 = Not inverted 1 = Inverted
P2.2.14	AI2 signal filter time	0.00	10.00	s	0.10		329	
P2.2.15	Reference scaling minimum value	0.00	320.00	Hz	0.00		303	
P2.2.16	Reference scaling maximum value	0.00	320.00	Hz	0.00		304	
P2.2.17	Free analog input, signal selection	0	2		0		361	0 = Not used 1 = Analog input 1 2 = Analog input 2
P2.2.18	Free analog input, function	0	4		0		362	0 = No reset 1 = Reduces current limit (P2.1.5) 2 = Reduces DC braking current, P2.4.8 3 = Reduces accel. and decel. times 4 = Reduces torque supervision limit, P2.3.15

<sup>1</sup> Parameter value can only be changed after the AC drive has been stopped.

<sup>2</sup> Use TTF method to program these parameters, see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#).

<sup>3</sup> Remember to place jumpers of block X2 according to the selection (0, 1 or 2). See the User Manual of the product.

CP = control place

cc = closing contact

oc = opening contact

#### 5.4.4 Output Signals (Control Panel: Menu M2 -> G2.3)

**Table 28: Output Signals, G2.3**

Index	Parameter	Min	Max	Unit	De- fault	Cust	ID	Description
P2.3.1 <sup>(1)</sup>	Analog output 1 signal selection	0.1	E.10		A.1		464	

Index	Parameter	Min	Max	Unit	De- fault	Cust	ID	Description
P2.3.2	Analog output function	0	8		1		307	0 = Not used (20 mA/10V) 1 = Output freq. (0- $f_{max}$ ) 2 = Freq. reference (0- $f_{max}$ ) 3 = Motor speed (0-Motor nominal speed) 4 = Motor current (0- $I_{nMotor}$ ) 5 = Motor torque (0- $T_{nMotor}$ ) 6 = Motor power (0- $P_{nMotor}$ ) 7 = Motor voltage (0- $U_{nMotor}$ ) 8 = DC-link volt (0-1000V)
P2.3.3	Analog output filter time	0.00	10.00	s	1.00		308	0 = No filtering
P2.3.4	Analog output inversion	0	1		0		309	0 = Not inverted 1 = Inverted
P2.3.5	Analog output minimum	0	1		0		310	0 = 0 mA (0 V) 1 = 4 mA (2 V)
P2.3.6	Analog output scale	10	1000	%	100		311	

Index	Parameter	Min	Max	Unit	De- fault	Cust	ID	Description
P2.3.7	Digital output 1 function	0	22		1		312	0 = Not used
P2.3.8	RO1 function	0	22		2		313	1 = Ready
P2.3.9	RO2 function	0	22		3		314	2 = Run 3 = Fault 4 = Fault inverted 5 = AC drive overheat warning 6 = Ext. fault or warning 7 = Ref. fault or warning 8 = Warning 9 = Reversed 10 = Jogging speed selected 11 = At speed 12 = Mot. regulator active 13 = OP freq. limit superv. 1 14 = OP freq. limit superv.2 15 = Torque limit superv. 16 = Ref. limit superv. 17 = Ext. brake control 18 = Control place: IO 19 = AC drive temp. limit superv. 20 = Unrequested rotation direction 21 = Ext. brake control inverted 22 = Thermistor fault/warn.
P2.3.10	Output frequency limit 1 supervision	0	2		0		315	0 = No limit 1 = Low limit supervision 2 = High limit supervision
P2.3.11	Output frequency limit 1; Supervised value	0.00	320.00	Hz	0.00		316	

Index	Parameter	Min	Max	Unit	De- fault	Cust	ID	Description
P2.3.12	Output frequency limit 2 supervision	0	2		0		346	0 = No limit 1 = Low limit supervision 2 = High limit supervision
P2.3.13	Output frequency limit 2; Supervision value	0.00	320.00	Hz	0.00		347	
P2.3.14	Torque limit supervision function	0	2		0		348	0 = No 1 = Low limit 2 = High limit
P2.3.15	Torque limit supervision value	-300.0	300.0	%	0.0		349	
P2.3.16	Reference limit supervision function	0	2		0		350	0 = No 1 = Low limit 2 = High limit
P2.3.17	Reference limit supervision value	0.0	100.0	%	0.0		351	
P2.3.18	External brake Off-delay	0.0	100.0	s	0.5		352	
P2.3.19	External brake On-delay	0.0	100.0	s	1.5		353	
P2.3.20	Frequency converter temperature limit supervision	0	2		0		354	0 = No 1 = Low limit 2 = High limit
P2.3.21	Frequency converter temperature limit value	-10	100	°C	40		355	
P2.3.22 <sup>(1)</sup>	Analog output 2 scaling	0.1	E.10		0.1		471	
P2.3.23 <sup>(1)</sup>	Analog output 2 function	0	8		4		472	As parameter 2.3.2
P2.3.24 <sup>(1)</sup>	Analog output 2 filter time	0.00	10.00	s	1.00		473	0 = No filtering
P2.3.25 <sup>(1)</sup>	Analog output 2 inversion	0	1		0		474	0 = Not inverted 1 = Inverted
P2.3.26 <sup>(1)</sup>	Analog output 2 minimum	0	1		0		475	0 = 0 mA (0 V) 1 = 4 mA (2 V)

Index	Parameter	Min	Max	Unit	De- fault	Cust	ID	Description
P2.3.27 <sup>(1)</sup>	Analog output 2 scaling	10	1000	%	1.00		476	

<sup>1</sup> Use TTF method to program these parameters, see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#).

### 5.4.5 Drive Control Parameters (Control Panel: Menu M2->G2.4)

**Table 29: Drive Control Parameters, G2.4**

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.4.1	Ramp 1 shape	0.0	10.0	s	0.1		500	0 = Linear  100 = full acc/dec inc/dec times
P2.4.2	Ramp 2 shape	0.0	10.0	s	0.0		501	0 = Linear  100 = full acc/dec inc/dec times
P2.4.3	Acceleration time 2	0.1	3000.0	s	1.0		502	
P2.4.4	Deceleration time 2	0.1	3000.0	s	1.0		503	
P2.4.5	Brake chopper	0	4		0		504	0 = Disabled  1 = Used when running  2 = External brake chopper  3 = Used when stopped/running  4 = Used when running (no testing)
P2.4.6	Start function	0	2		0		505	0 = Ramp  1 = Flying start  2 = Conditional flying start
P2.4.7	Stop function	0	3		0		506	0 = Coasting  1 = Ramp  2 = Ramp+Run enable coast  3 = Coast+Run enable ramp
P2.4.8	DC braking current	0.00	$I_L$	A	$0.7 \times I_H$		507	
P2.4.9	DC braking time at stop	0.00	600.00	s	0.00		508	0 = DC brake is off at stop
P2.4.10	Frequency to start DC braking during ramp stop	0.10	10.00	Hz	1.50		515	
P2.4.11	DC braking time at start	0.00	600.00	s	0.00		516	0 = DC brake is off at start

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.4.12	Flux brake	0	1		0		520	0 = Off 1 = On
P2.4.13	Flux braking current	0.00	I <sub>L</sub>	A	I <sub>H</sub>		519	

#### 5.4.6 Prohibit Frequency Parameters (Control Panel: Menu M2 -> G2.5)

Table 30: Prohibit Frequency Parameters, G2.5

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.5.1	Prohibit frequency range 1 low limit	0.00	320.00	Hz	0.00		509	
P2.5.2	Prohibit frequency range 1 high limit	0.00	320.00	Hz	0.00		510	0 = Prohibit range 1 is off
P2.5.3	Prohibit frequency range 2 low limit	0.00	320.00	Hz	0.00		511	
P2.5.4	Prohibit frequency range 2 high limit	0.00	320.00	Hz	0.00		512	0 = Prohibit range 2 is off
P2.5.5	Prohibit frequency range 3 low limit	0.00	320.00	Hz	0.00		513	
P2.5.6	Prohibit frequency range 3 high limit	0.00	320.00	Hz	0.00		514	0 = Prohibit range 3 is off
P2.5.7	Prohibit acc./dec. ramp	0.1	10.0	x	1.0		518	

#### 5.4.7 Motor Control Parameters (Control Panel: Menu M2 -> G2.6)

Table 31: Motor Control Parameters, G2.6

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.6.1 <sup>(1)</sup>	Motor control mode	0	1/4		0		600	0 = Frequency control 1 = Speed control <b>VACON® NXP:</b> 2 = Open loop torque control 3 = Closed loop speed ctrl 4 = Closed loop torque control
P2.6.2 <sup>(1)</sup>	U/f optimisation	0	1		0		109	0 = Not used 1 = Automatic torque boost
P2.6.3 <sup>(1)</sup>	U/f ratio selection	0	3		0		108	0 = Linear 1 = Squared 2 = Programmable 3 = Linear with flux optim.



Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.6.4 <sup>(1)</sup>	Field weakening point	8.00	320.00	Hz	50.00		602	
P2.6.5 <sup>(1)</sup>	Voltage at field weakening point	10.00	200.00	%	100.00		603	
P2.6.6 <sup>(1)</sup>	U/f curve midpoint frequency	0.00	P2.6.4	Hz	50.00		604	
P2.6.7 <sup>(1)</sup>	U/f curve midpoint voltage	0.00	100.00	%	100.00		605	
P2.6.8 <sup>(1)</sup>	Output voltage at zero frequency	0.00	40.00	%	Varies		606	
P2.6.9	Switching frequency	1.0	Varies	kHz	Varies		601	
P2.6.10	Overvoltage controller	0	2		1		607	0 = Not used 1 = Used (no ramping) 2 = Used (ramping)
P2.6.11	Undervoltage controller	0	2		2		608	0 = Not used 1 = Used 2 = Used (ramping to zero)
P2.6.12	Load drooping	0.00	100.00	%	0.00		620	
P2.6.13	Identification	0	2/5		0		631	0 = No action 1 = Identification w/o run 2 = Identification with run  <b>Only VACON® NXP:</b> 3 = Encoder ID run 4 = No action 5 = ID Run Failed
<b>Closed Loop parameter group 2.6.14</b>								
P2.6.14.1	Magnetizing current	0.00	2 x I <sub>H</sub>	A	0.00		612	
P2.6.14.2	Speed control P gain	1	1000		30		613	
P2.6.14.3	Speed control I time	0.0	3200.0	ms	30.0		614	
P2.6.14.5	Acceleration compensation	0.00	300.00	s	0.00		626	
P2.6.14.6	Slip adjust	0	500	%	100		619	
P2.6.14.7	Magnetizing current at start	0.00	I <sub>L</sub>	A	0.00		627	
P2.6.14.8	Magnetizing time at start	0	60000	ms	0		628	
P2.6.14.9	0-speed time at start	0	32000	ms	100		615	
P2.6.14.10	0-speed time at stop	0	32000	ms	100		616	

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.6.14.11	Start-up torque	0	3		0		621	0 = Not used 1 = Torque memory 2 = Torque reference 3 = Start-up torque fwd/rev
P2.6.14.12	Start-up torque FWD	-300.0	300.0	%	0.0		633	
P2.6.14.13	Start-up torque REV	-300.0	300.0	%	0.0		634	
P2.6.14.15	Encoder filter time	0.0	100	ms	0.0		618	
P2.6.14.17	Current control P gain	0.00	100.00	%	40.00		617	
<b>Identification parameter group 2.6.15</b>								
P2.6.15.1	Speed step	-50.0	50.0		0.0		1252	

#### 5.4.8 Protections (Control Panel: Menu M2 -> G2.7)

Table 32: Protections, G2.7

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.7.1	Response to 4 mA reference fault	0	5		0		700	0 = No response 1 = Warning 2 = Warning+Previous Freq. 3 = Wrng+Preset- Freq 2.7.2 4 = Fault, stop acc. to 2.4.7 5 = Fault, stop by coasting
P2.7.2	4 mA reference fault frequency	0.00	P2.1.2	Hz	0.00		728	
P2.7.3	Response to external fault	0	3		2		701	0 = No response
P2.7.4	Input phase supervision	0	3		3		730	1 = Warning 2 = Fault, stop acc. to 2.4.7 3 = Fault, stop by coasting
P2.7.5	Response to undervoltage fault	0	1		0		727	0 = Fault stored in history 1 = Fault not stored

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.7.6	Output phase supervision	0	3		2		702	0 = No response
P2.7.7	Earth fault protection	0	3		2		703	1 = Warning
P2.7.8	Thermal protection of the motor	0	3		2		704	2 = Fault, stop acc. to 2.4.7 3 = Fault, stop by coasting
P2.7.9	Motor ambient temperature factor	-100.0	100.0	%	0.0		705	
P2.7.10	Motor cooling factor at zero speed	0.0	150.0	%	40.0		706	
P2.7.11	Motor thermal time constant	1	200	min	Varies		707	
P2.7.12	Motor duty cycle	0	150	%	100		708	
P2.7.13	Stall protection	0	3		0		709	0 = No response 1 = Warning 2 = Fault, stop acc. to 2.4.7 3 = Fault, stop by coasting
P2.7.14	Stall current	0.00	2 x I <sub>H</sub>	A	I <sub>H</sub>		710	
P2.7.15	Stall time limit	1.00	120.00	s	15.00		711	
P2.7.16	Stall frequency limit	1.0	P2.1.2	Hz	25.00		712	
P2.7.17	Underload protection	0	3		0		713	0 = No response 1 = Warning 2 = Fault, stop acc. to 2.4.7 3 = Fault, stop by coasting
P2.7.18	Field weakening area load	10.0	150.0	%	50.0		714	
P2.7.19	Zero frequency load	5.0	150.0	%	10.0		715	
P2.7.20	Underload protection time limit	2.00	600.00	s	20.00		716	
P2.7.21	Response to thermistor fault	0	3		2		732	0 = No response
P2.7.22	Response to fieldbus fault	0	3		2		733	1 = Warning
P2.7.23	Response to slot fault	0	3				734	2 = Fault, stop acc. to 2.4.7 3 = Fault, stop by coasting

### 5.4.9 Autorestart Parameters (Control Panel: Menu M2 -> G2.8)

**Table 33: Autorestart Parameters, G2.8**

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.8.1	Wait time	0.10	10.00	s	0.50		717	

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.8.2	Trial time	0.00	60.00	s	30.00		718	
P2.8.3	Start function	0	2		0		719	0 = Ramp 1 = Flying start 2 = According to P2.4.6
P2.8.4	Number of tries after undervoltage trip	0	10		0		720	
P2.8.5	Number of tries after overvoltage trip	0	10		0		721	
P2.8.6	Number of tries after overcurrent trip	0	3		0		722	
P2.8.7	Number of tries after 4mA reference trip	0	10		0		723	
P2.8.8	Number of tries after motor temperature fault trip	0	10		0		726	
P2.8.9	Number of tries after external fault trip	0	10		0		725	
P2.8.10	Number of tries after underload fault trip	0	10		0		738	

#### 5.4.10 Keypad Control (Control Panel: Menu M3)

The parameters for the selection of control place and direction on the keypad are listed in this table. See the *Keypad control* menu in the User Manual of the product.

**Table 34: Keypad Control Parameters, M3**

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P3.1	Control place	1	3		1		125	1 = I/O terminal 2 = Keypad 3 = Fieldbus
P3.2	Keypad reference	P2.1.1	P2.1.2	Hz	0.00			
P3.3	Direction (on keypad)	0	1		0		123	0 = Forward 1 = Reverse
R3.4	Stop button	0	1		1		114	0 = Limited function of Stop button 1 = Stop button always enabled

#### 5.4.11 System Menu (Control Panel: Menu M6)

For more information related to the general use of the AC drive, such as selecting application and language, customized parameter sets, or hardware and software, see the User Manual of the product.

### 5.4.12 Expander Boards (Control Panel: Menu M7)

The *M7* menu shows the expander and option boards attached to the control board and board-related information. For more information, see the User Manual of the product.

## 6 PID Control Application

### 6.1 Introduction to PID Control Application

Select the PID Control Application in menu *M6* on page *S6.2*.

In the PID Control Application, there are two I/O terminal control places; place A is the PID controller and source B is the direct frequency reference. The control place A or B is selected with digital input DIN 6.

The PID controller reference can be selected from the analog inputs, fieldbus, motorized potentiometer, enabling the PID Reference 2 or applying the keypad reference. The PID controller actual value can be selected from the analog inputs, fieldbus, the actual values of the motor or through the mathematical functions of these.

The direct frequency reference can be used for the control without the PID controller and selected from the analog inputs, fieldbus, motor potentiometer, or keypad.

The PID Application is typically used to control level measuring or pumps and fans. In these applications, the PID Application provides a smooth control and an integrated measuring and controlling package where no additional components are needed.

- Digital inputs DIN 2, DIN 3, DIN 5 and all the outputs are freely programmable.

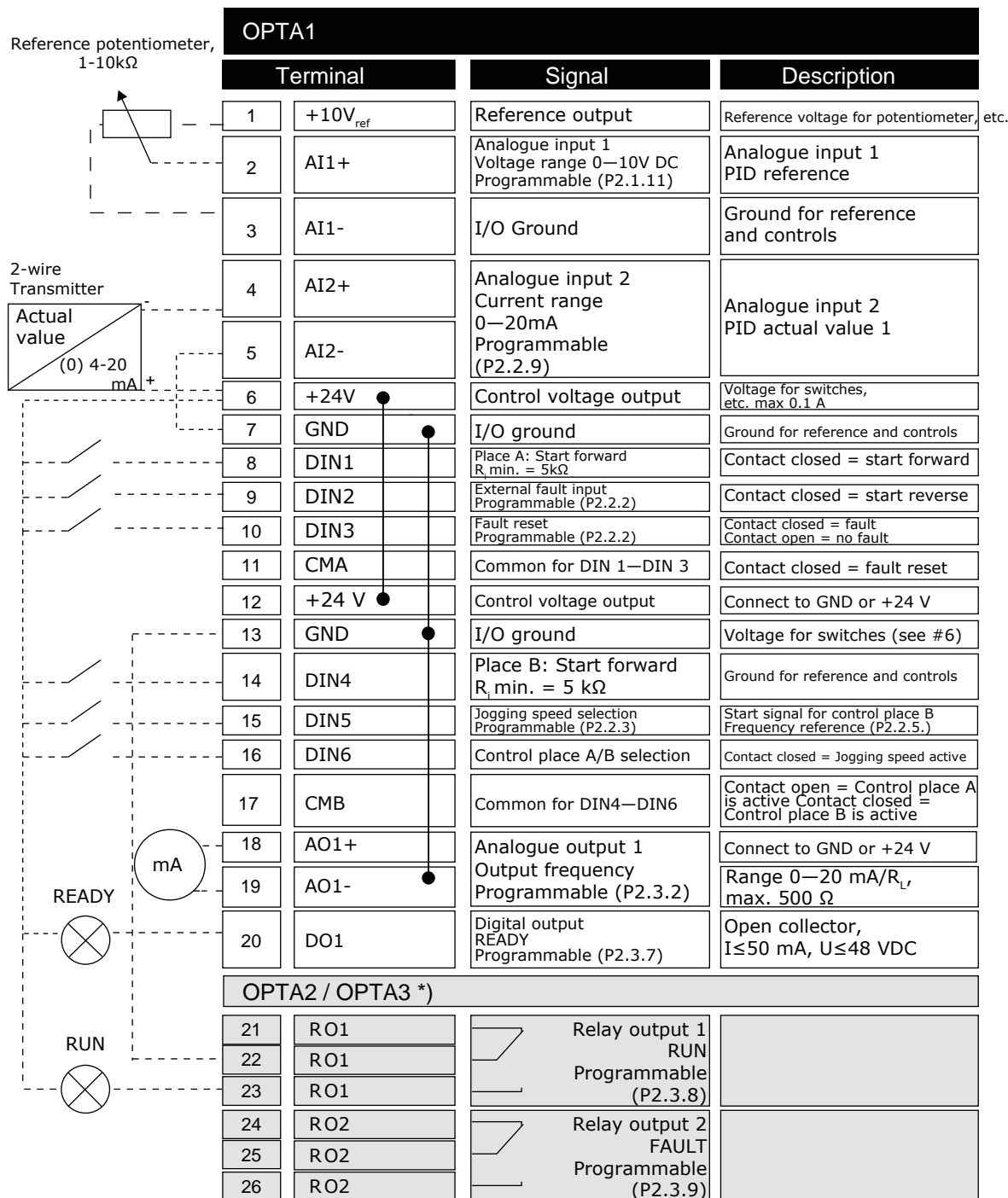
#### Extra functions:

- Analog input signal range selection
- Two frequency limit supervisions
- Torque limit supervision
- Reference limit supervision
- Second ramps and S-shape ramp programming
- Programmable start and stop functions
- DC brake at start and stop
- Three prohibit frequency areas
- Programmable U/f curve and switching frequency
- Auto restart
- Motor thermal and stall protection: fully programmable; off, warning, fault
- Motor underload protection
- Input and output phase supervision
- Sum point frequency addition to PID output
- The PID controller can be also used from control places I/O B, keypad, and fieldbus
- Easy ChangeOver function
- Sleep function

The parameters of the PID Control Application are explained in Chapter Parameter descriptions of this manual. The explanations are arranged according to the individual ID number of the parameter.

6.2 Control I/O in PID Control Application

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\* The option board A3 has no terminal for open contact on its second relay output (terminal 24 is missing).

Illustration 14: Default I/O Configuration in PID Control Application

See jumper selections in [illustration 15](#). More information in the User Manual of the product.

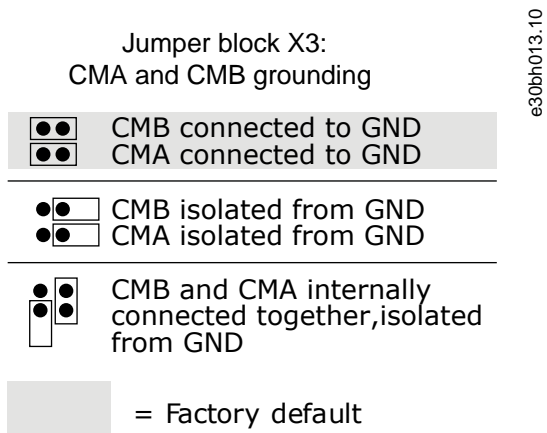


Illustration 15: Jumper Selections



### 6.3 Control Signal Logic in PID Control Application

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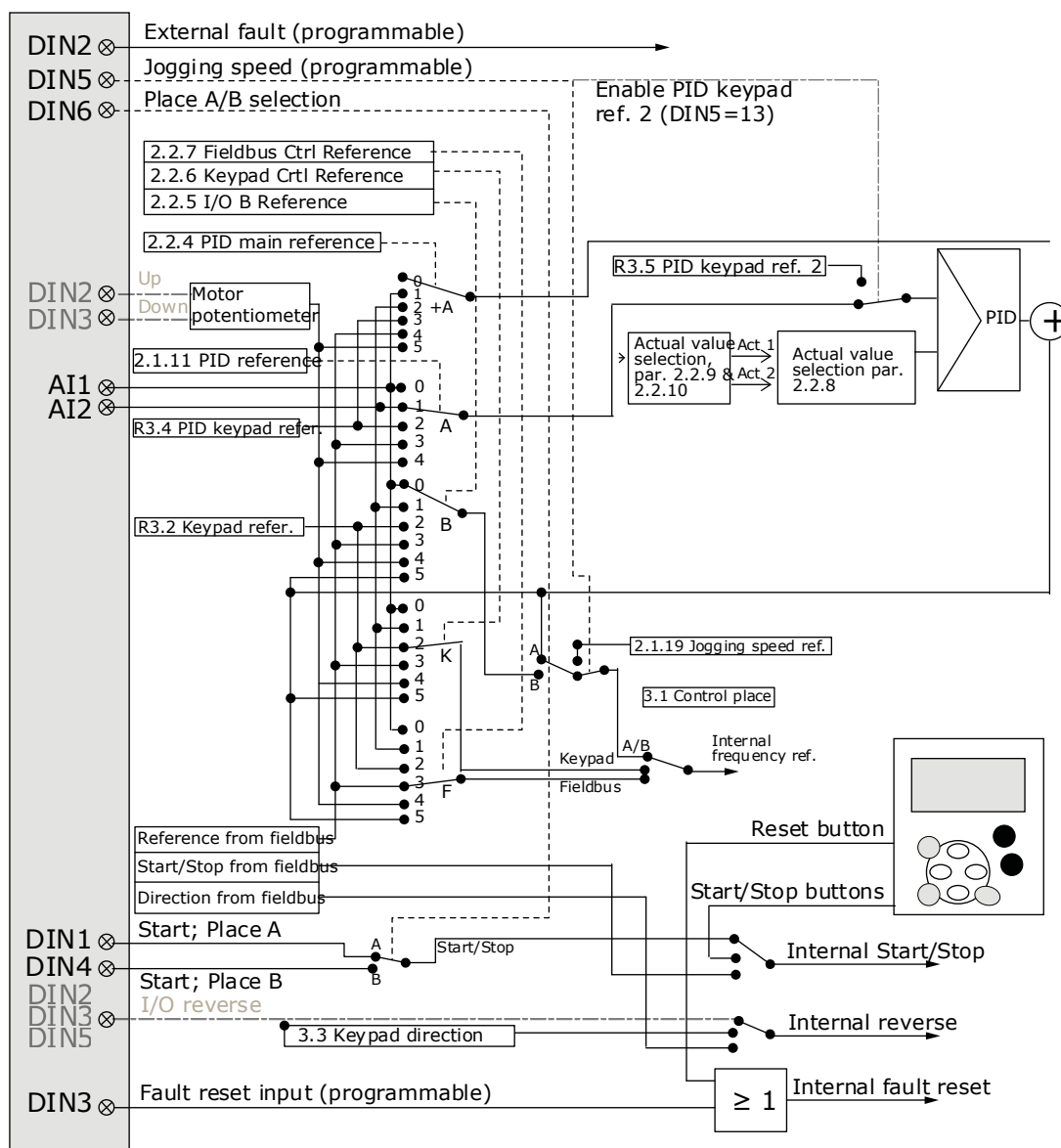


Illustration 16: Control Signal Logic of the PID Control Application

## 6.4 Parameter Lists for PID Control Application

### 6.4.1 Monitoring Values (Control Panel: Menu M1)

The monitoring values are the actual values of parameters and signals as well as statuses and measurements. Monitoring values cannot be edited.

The monitoring values V1.19 to V1.22 are available with the PID control application only.

**Table 35: Monitoring Values**

Index	Monitoring value	Unit	Form	ID	Description
V1.1	Output frequency	Hz	###	1	
V1.2	Frequency reference	Hz	###	25	
V1.3	Motor speed	RPM	#	2	
V1.4	Motor current	A	Varies	3	
V1.5	Motor torque	%	##	4	
V1.6	Motor shaft power	%	##	5	
V1.7	Motor voltage	V	##	6	
V1.8	DC-link voltage	V	#	7	
V1.9	Unit temperature	°C	#	8	
V1.10	Motor temperature	%	##	9	
V1.11	Analog input 1	V/mA	###	13	
V1.12	Analog input 2	V/mA	###	14	
V1.13	Analog input 3			27	
V1.14	Analog input 4			28	
V1.15	DIN 1, 2,3			15	
V1.16	DIN 4, 5, 6			16	
V1.17	DO1, RO1, RO2			17	
V1.18	Analog I <sub>out</sub>	mA	###	26	
V1.19	PID Reference	%		20	
V1.20	PID Actual value	%		21	
V1.21	PID Error value	%		22	
V1.22	PID Output	%		23	
V1.23	Special display for actual value			29	
V1.24	PT-100 Temperature	°C	##	42	
G1.25	Monitoring items				
V1.26.1	Current	A	Varies	1113	
V1.26.2	Torque	%	##	1125	
V1.26.3	DC Voltage	V	#	44	
V1.26.4	Status Word			43	

## 6.4.2 Basic Parameters (Keypad Panel: Menu M2 -> G2.1)

**Table 36: Basic Parameters G2.1**

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.1.1	Min frequency	0.00	P2.1.2	Hz	0.00		101	
P2.1.2	Max frequency	P2.1.1	320.00	Hz	50.00		102	
P2.1.3	Acceleration time 1	0.1	3000.0	s	0.0		103	
P2.1.4	Deceleration time 1	0.1	3000.0	s	0.0		104	
P2.1.5	Current limit	0.1 x I <sub>H</sub>	2 x I <sub>H</sub>	A	I <sub>L</sub>		107	
P2.1.6 <sup>(1)</sup>	Nominal voltage of the motor	180	690	V	NX2: 230 V NX5: 400 V NX6: 690 V		110	
P2.1.7 <sup>(1)</sup>	Nominal frequency of the motor	8.00	320.00	Hz	50.00		111	
P2.1.8 <sup>(1)</sup>	Nominal speed of the motor	24	20 000	RPM	1440		112	
P2.1.9 <sup>(1)</sup>	Nominal current of the motor	0.1 x I <sub>H</sub>	2 X I <sub>H</sub>	A	I <sub>H</sub>		113	
P2.1.10 <sup>(1)</sup>	Motor cos phi	0.30	1.00		0.85		120	
P2.1.11 <sup>(1)</sup>	PID controller reference signal (Place A)	0	4		1		332	0 = AI1 1 = AI2 2 = PID ref from Keypad control page, P3.4 3 = PID ref from fieldbus (Process- DataIN 1) 4 = Motor potentiometer
P2.1.12	PID controller gain	0.0	1000.0	%	100.0		118	
P2.1.13	PID controller I-time	0.00	320.00	s	1.00		119	
P2.1.14	PID controller D-time	0.00	100.00	s	0.00		132	
P2.1.15	Sleep frequency	0.00	P2.1.2	Hz	10.00		1016	
P2.1.16	Sleep delay	0	3600	s	30		1017	
P2.1.17	Wake up level	0.00	100.00	%	25.00		1018	
P2.1.18	Wake up function	0	1		0		1019	0 = Wake-up at fall below wake up level (2.1.17) 1 = Wake-up at exceeded wake up level (2.1.17)
P2.1.19	Jogging speed reference	0.00	P2.1.2	Hz	10.00		124	

<sup>1</sup> Parameter value can only be changed after the AC drive has been stopped.

### 6.4.3 Input Signals (Control Panel: Menu M2 -> G2.2)

Table 37: Input Signals, G2.2

Index	Parameter	Min	Max	Unit	De- fault	Cust	ID	Description
P2.2.1 <sup>(1)</sup>	DIN 2 function	0	13		1		319	0 = Not used 1 = External fault cc 2 = External fault oc 3 = Run enable 4 = Acc/Dec time selection 5 = CP: I/O terminal (ID125) 6 = CP: Keypad (ID125) 7 = CP: Fieldbus (ID125) 8 = Forward/ Reverse 9 = Jogging frequency (cc) 10 = Fault reset (cc) 11 = Acc/Dec prohibit (cc) 12 = DC braking command 13 = Motor pot. UP (cc)
P2.2.2 <sup>(1)</sup>	DIN 3 function	0	13		10		301	See above except: 13 = Motor pot. DOWN (cc)
P2.2.3 <sup>(1)</sup>	DIN 5 function	0	13		9		330	See above except: 13 = Enable PID reference 2

Index	Parameter	Min	Max	Unit	De- fault	Cust	ID	Description
P2.2.4 <sup>(1)</sup>	PID sum point reference	0	7		0		376	0 = Direct PID output value 1 = AI1+PID output 2 = AI2+PID output 3 = AI3+PID output 4 = AI4+PID output 5 = PID keypad +PID output 6 = Fieldbus+PID output (Process- Data-IN3) 7 = Mot.pot.+PID output
P2.2.5 <sup>(1)</sup>	I/O B reference selection	0	7		1		343	0 = AI1 1 = AI2
P2.2.6 <sup>(1)</sup>	Keypad control reference selection	0	7		4		121	2 = AI3 3 = AI4
P2.2.7 <sup>(1)</sup>	Fieldbus control reference selection	0	7		5		122	4 = Keypad reference 5 = Fieldbus reference (FBSpeedReference) 6 = Motor potentiometer 7 = PID controller
P2.2.8 <sup>(1)</sup>	Actual value selection	0	7		0		333	0 = Actual value 1 1 = Actual 1 + Actual 2 2 = Actual 1 – Actual 2 3 = Actual 1 x Actual 2 4 = Min(Actual 1, Actual 2) 5 = Max(Actual 1, Actual 2) 6 = Mean(Actual1, Actual2) 7 = Sqrt (Act1) + Sqrt (Act2)

Index	Parameter	Min	Max	Unit	De- fault	Cust	ID	Description
P2.2.9 <sup>(1)</sup>	Actual value 1 selection	0	10		2		334	0 = Not used 1 = AI1 signal (cboard) 2 = AI2 signal (cboard) 3 = AI3 4 = AI4 5 = Fieldbus ProcessDataIN2 6 = Motor torque 7 = Motor speed 8 = Motor current 9 = Motor power 10 = Encoder frequency
P2.2.10 <sup>(1)</sup>	Actual value 2 input	0	10		0		335	0 = Not used 1 = AI1 signal 2 = AI2 signal 3 = AI3 4 = AI4 5 = Fieldbus ProcessDataIN3 6 = Motor torque 7 = Motor speed 8 = Motor current 9 = Motor power 10 = Encoder Frequency
P2.2.11	Actual value 1 minimum scale	-1600.0	1600.0	%	0.0		336	0 = No minimum scaling
P2.2.12	AI2 custom setting maximum	-1600.0	1600.0	%	100.0		337	100 = No maximum scaling
P2.2.13	AI2 signal inversion	-1600.0	1600.0	%	0.0		338	0 = No minimum scaling
P2.2.14	AI2 signal filter time	-1600.0	1600.0	%	100.0		339	100 = No maximum scaling
P2.2.15 <sup>(2)</sup>	AI1 signal selection	0.1	E.10		A.1		377	

Index	Parameter	Min	Max	Unit	De- fault	Cust	ID	Description
P2.2.16 <sup>(3)</sup>	AI1 signal range	0	2		0		320	0 = 0–10 V (0–20 mA) 1 = 2–10 V (4–20 mA) 2 = Custom range
P2.2.17	AI1 custom minimum setting	-160.00	160.00	%	0.00		321	
P2.2.18	Free analog input, function	-160.00	160.00	%	100.0		322	
P2.2.19	AI1 inversion	0	1		0		323	0 = Not inverted 1 = Inverted
P2.2.20	AI1 filter time	0.00	10.00	s	0.10		324	
P2.2.21 <sup>(3)</sup>	AI2 signal selection	0.1	E.10		A.2		388	0 = 0–20 mA (0– 10 V) 1 = 4–20 mA (2– 10 V) 2 = Custom range
P2.2.22 <sup>(3)</sup>	AI2 signal range	0	2		1		325	0 = 0–20 mA 1 = 4–20 mA 2 = Customised
P2.2.23	AI2 custom minimum setting	-160.00	160.00	%	0.00		326	
P2.2.24	AI2 custom maximum setting	-160.00	160.00	%	0.00		327	
P2.2.25	AI2 inversion	0	1		0		328	0 = Not inverted 1 = Inverted
P2.2.26	AI2 filter time	0.00	10.00	s	0.10		329	0 = No filtering
P2.2.27	Motor potentiometer ramp time	0.1	2000.0	Hz/s	10.0		331	
P2.2.28	Motor potentiometer frequency reference memory reset	0	2		1		367	0 = No reset 1 = Reset if stopped or powered down
P2.2.29	Motor potentiometer PID reference memory reset	0	2		0		370	2 = Reset if powered down
P2.2.30	PID minimum limit	-1600.0	P2.2.31	%	0.0		359	
P2.2.31	PID maximum limit	P2.2.30	1600.0	%	100.0		360	
P2.2.32	Error value inversion	0	1		0		340	0 = No inversion 1 = Inversion

Index	Parameter	Min	Max	Unit	De- fault	Cust	ID	Description
P2.2.33	PID reference rising time	0.1	100.0	s	5.0		341	
P2.2.34	PID reference falling time	0.1	100.0	s	5.0		342	
P2.2.35	Reference scaling minimum value, place B	0.00	320.0	Hz	0.00		344	
P2.2.36	Reference scaling maximum value, place B	0.00	320.0	Hz	0.00		345	
P2.2.37	Easy changeover	0	1		0		366	0 = Keep reference 1 = Copy actual reference
P2.2.38 <sup>(2)</sup>	AI3 signal selection	0.1	E.10		0.1		141	
P2.2.39	AI3 signal range	0	1		1		143	0 = Signal range 0–10 V 1 = Signal range 2–10 V
P2.2.40	AI3 inversion	0	1		0		151	0 = Not inverted 1 = Inverted
P2.2.41	AI3 filter time	0.00	10.00	s	0.10		142	0 = No filtering
P2.2.42 <sup>(2)</sup>	AI4 signal selection	0.1	E.10		0.1		152	
P2.2.43	AI4 signal range	0	1		1		154	0 = Signal range 0–10 V 1 = Signal range 2–10 V
P2.2.44	AI4 inversion	0	1		0		162	0 = Not inverted 1 = Inverted
P2.2.45	AI4 filter time	0.00	10.00	s	0.10		153	0 = No filtering
P2.2.46	Actual value special display minimum	0	30000		0		1033	
P2.2.47	Actual value special display maximum	0	30000		100		1034	
P2.2.48	Actual value special display decimals	0	4		1		1035	
P2.2.49	Actual value special display unit	0	29		4		1036	See <a href="#">10.437 (ID 1036) Actual Value Special Display Unit</a> .

<sup>1</sup> Parameter value can only be changed after the AC drive has been stopped.

<sup>2</sup> Use TTF method to program these parameters, see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#).

<sup>3</sup> Remember to place jumpers of block X2 according to the selection (0, 1 or 2). See the User Manual of the product.



- CP = control place
- cc = closing contact
- oc = opening contact

#### 6.4.4 Output Signals (Control Panel: Menu M2 -> G2.3)

Table 38: Output Signals, G2.3

Index	Parameter	Min	Max	Unit	De- fault	Cust	ID	Description
P2.3.1 <sup>(1)</sup>	Analog output 1 signal selection	0.1	E.10		A.1		464	
P2.3.2	Analog output function	0	14		1		307	0 = Not used 1 = Output freq. (0- $f_{max}$ ) 2 = Freq. reference (0- $f_{max}$ ) 3 = Motor speed (0-Motor nominal speed) 4 = Motor current (0- $I_{nMotor}$ ) 5 = Motor torque (0- $T_{nMotor}$ ) 6 = Motor power (0- $P_{nMotor}$ ) 7 = Motor voltage (0- $U_{nMotor}$ ) 8 = DC-link volt (0-1000 V) 9 = PID controller ref. value 10 = PID contr. act. value 1 11 = PID contr. act. value 2 12 = PID contr. error value 13 = PID controller output 14 = PT100 temperature
P2.3.3	Analog output filter time	0.00	10.00	s	1.00		308	0 = No filtering
P2.3.4	Analog output inversion	0	1		0		309	0 = Not inverted 1 = Inverted
P2.3.5	Analog output minimum	0	1		0		310	0 = 0 mA (0 V) 1 = 4 mA (2 V)
P2.3.6	Analog output scale	10	1000	%	100		311	

Index	Parameter	Min	Max	Unit	De- fault	Cust	ID	Description
P2.3.7	Digital output 1 function	0	23		1		312	0 = Not used
P2.3.8	RO1 function	0	23		2		313	1 = Ready
P2.3.9	RO2 function	0	23		3		314	2 = Run 3 = Fault 4 = Fault inverted 5 = AC drive overheat warning 6 = Ext. fault or warning 7 = Ref. fault or warning 8 = Warning 9 = Reversed 10 = Preset speed 1 11 = At speed 12 = Mot. regulator active 13 = OP freq. limit superv. 1 14 = OP freq. limit superv.2 15 = Torque limit superv. 16 = Ref. limit superv. 17 = Ext. brake control 18 = Control place: IO 19 = AC drive temp. limit superv. 20 = Unrequested rotation direction 21 = Ext. brake control inverted 22 = Thermistor fault/warn. 23 = Fieldbus DIN 1
P2.3.10	Output frequency limit 1 supervision	0	2		0		315	0 = No limit 1 = Low limit supervision 2 = High limit supervision

Index	Parameter	Min	Max	Unit	De- fault	Cust	ID	Description
P2.3.11	Output frequency limit 1; Supervised value	0.00	320.00	Hz	0.00		316	
P2.3.12	Output frequency limit 2 supervision	0	2		0		346	0 = No limit 1 = Low limit supervision 2 = High limit supervision
P2.3.13	Output frequency limit 2; Supervision value	0.00	320.00	Hz	0.00		347	
P2.3.14	Torque limit supervision function	0	2		0		348	0 = No 1 = Low limit 2 = High limit
P2.3.15	Torque limit supervision value	-300.0	300.0	%	100.0		349	
P2.3.16	Reference limit supervision function	0	2		0		350	0 = No 1 = Low limit 2 = High limit
P2.3.17	Reference limit supervision value	0.0	100.0	%	0.0		351	
P2.3.18	External brake Off-delay	0.0	100.0	s	0.5		352	
P2.3.19	External brake On-delay	0.0	100.0	s	1.5		353	
P2.3.20	Frequency converter temperature limit supervision	0	2		0		354	0 = No 1 = Low limit 2 = High limit
P2.3.21	Frequency converter temperature limit value	-10	100	°C	40		355	
P2.3.22	Analogue output 2 scaling	0.1	E.10		0.1		471	
P2.3.23	Analogue output 2 function	0	14		4		472	As parameter 2.3.2
P2.3.24	Analog output 2 filter time	0.00	10.00	s	1.00		473	0 = No filtering
P2.3.25	Analog output 2 inversion	0	1		0		474	0 = Not inverted 1 = Inverted

Index	Parameter	Min	Max	Unit	De- fault	Cust	ID	Description
P2.3.26	Analog output 2 minimum	0	1		0		475	0 = 0 mA (0 V) 1 = 4 mA (2 V)
P2.3.27	Analog output 2 scaling	10	1000	%	1.00		476	

<sup>1</sup> Use TTF method to program these parameters, see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#).

## 6.4.5 Drive Control Parameters (Control Panel: Menu M2 -> G2.4)

Table 39: Drive Control Parameters, G2.4

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.4.1	Ramp 1 shape	0.0	10.0	s	0.1		500	0 = Linear >0 = S-curve ramp time
P2.4.2	Ramp 2 shape	0.0	10.0	s	0.0		501	0 = Linear >0 = S-curve ramp time
P2.4.3	Acceleration time 2	0.1	3000.0	s	1.0		502	
P2.4.4	Deceleration time 2	0.1	3000.0	s	1.0		503	
P2.4.5	Brake chopper	0	4		0		504	0 = Disabled 1 = Used when running 2 = External brake chopper 3 = Used when stopped/running 4 = used when running (no testing)
P2.4.6	Start function	0	2		0		505	0 = Ramp 1 = Flying start 2 = Conditional flying start
P2.4.7	Stop function	0	3		0		506	0 = Coasting 1 = Ramp 2 = Ramp+Run enable coast 3 = Coast+Run enable ramp
P2.4.8	DC braking current	0.00	$I_L$	A	$0.7 \times I_H$		507	
P2.4.9	DC braking time at stop	0.00	600.00	s	0.00		508	0 = DC brake is off at stop
P2.4.10	Frequency to start DC braking during ramp stop	0.10	10.00	Hz	1.50		515	

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.4.11	DC braking time at start	0.00	600.00	s	0.00		516	0 = DC brake is off at start
P2.4.12	Flux brake	0	1		0		520	0 = Off 1 = On
P2.4.13	Flux braking current	0.00	I <sub>L</sub>	A	I <sub>H</sub>		519	

## 6.4.6 Prohibit Frequency Parameters (Control Panel: Menu M2 -> G2.5)

Table 40: Prohibit Frequency Parameters, G2.5

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.5.1	Prohibit frequency range 1 low limit	-1.00	320.00	Hz	0.00		509	0 = Not used
P2.5.2	Prohibit frequency range 1 high limit	0.00	320.00	Hz	0.00		510	0 = Not used
P2.5.3	Prohibit frequency range 2 low limit	0.00	320.00	Hz	0.00		511	0 = Not used
P2.5.4	Prohibit frequency range 2 high limit	0.00	320.00	Hz	0.00		512	0 = Not used
P2.5.5	Prohibit frequency range 3 low limit	0.00	320.00	Hz	0.00		513	0 = Not used
P2.5.6	Prohibit frequency range 3 high limit	0.00	320.00	Hz	0.00		514	0 = Not used
P2.5.7	Prohibit acc./dec. ramp	0.1	10.0	x	1.0		518	

## 6.4.7 Motor Control Parameters (Control Panel: Menu M2 -> G2.6)

Table 41: Motor Control Parameters, G2.6

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.6.1	Motor control mode	0	1/4		0		600	0 = Frequency control 1 = Speed control <b>VACON® NXP:</b> 2 = Open loop torque control 3 = Closed loop speed ctrl 4 = Closed loop torque control
P2.6.2	U/f optimisation	0	1		0		109	0 = Not used 1 = Automatic torque boost

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.6.3	U/f ratio selection	0	3		0		108	0 = Linear 1 = Squared 2 = Programmable 3 = Linear with flux optim.
P2.6.4	Field weakening point	8.00	320.00	Hz	50.00		602	
P2.6.5	Voltage at field weakening point	10.00	200.00	%	100.00		603	
P2.6.6	U/f curve midpoint frequency	0.00	P2.6.4	Hz	50.00		604	
P2.6.7	U/f curve midpoint voltage	0.00	100.00	%	100.00		605	
P2.6.8	Output voltage at zero frequency	0.00	40.00	%	Varies		606	
P2.6.9	Switching frequency	1.0	Varies	kHz	Varies		601	
P2.6.10	Overvoltage controller	0	2		1		607	0 = Not used 1 = Used (no ramping) 2 = Used (ramping)
P2.6.11	Undervoltage controller	0	2		1		608	0 = Not used 1 = Used 2 = Used (ramping to zero)
P2.6.12	Load drooping	0.00	100.00	%	0.00		620	
P2.6.13	Identification	0	2/5		0		631	0 = No action 1 = Identification w/o run 2 = Identification with run <b>VACON® NXP only:</b> 3 = Encoder ID run 4 = No action 5 = ID Run Failed
<b>Closed Loop parameter group 2.6.14</b>								
P2.6.14.1	Magnetizing current	0.00	2 x I <sub>H</sub>	A	0.00		612	
P2.6.14.2	Speed control P gain	1	1000		30		613	
P2.6.14.3	Speed control I time	0.0	3200.0	ms	30.0		614	
P2.6.14.5	Acceleration compensation	0.00	300.00	%	0.00		626	
P2.6.14.6	Slip adjust	0	500	%	100		619	

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.6.14.7	Magnetizing current at start	0.00	$I_L$	A	0.00		627	
P2.6.14.8	Magnetizing time at start	0	60000	ms	0		628	
P2.6.14.9	0-speed time at start	0	32000	ms	100		615	
P2.6.14.10	0-speed time at stop	0	32000	ms	100		616	
P2.6.14.11	Start-up torque	0	3		0		621	0 = Not used 1 = Torque memory 2 = Torque reference 3 = Start-up torque fwd/rev
P2.6.14.12	Start-up torque FWD	-300.0	300.0	%	0.0		633	
P2.6.14.13	Start-up torque REV	-300.0	300.0	%	0.0		634	
P2.6.14.15	Encoder filter time	0.0	100	ms	0.0		618	
P2.6.14.17	Current control P gain	0.00	100.00	%	40.00		617	
<b>Identification parameter group 2.6.15</b>								
P2.6.15.1	Speed step	-50.0	50.0	%	0.0		1252	

## 6.4.8 Protections (Control Panel: Menu M2 -> G2.7)

Table 42: Protections, G2.7

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.7.1	Response to 4 mA reference fault	0	5		4		700	0 = No response 1 = Warning 2 = Warning+Previous Freq. 3 = Wrng+Preset- Freq 2.7.2 4 = Fault, stop acc. to 2.4.7 5 = Fault, stop by coasting
P2.7.2	4 mA reference fault frequency	0.00	P2.1.2	Hz	0.00		728	
P2.7.3	Response to external fault	0	3		2		701	0 = No response
P2.7.4	Input phase supervision	0	3		0		730	1 = Warning 2 = Fault, stop acc. to 2.4.7 3 = Fault, stop by coasting
P2.7.5	Response to undervoltage fault	0	1		0		727	0 = Fault stored in history 1 = Fault not stored

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.7.6	Output phase supervision	0	3		2		702	0 = No response
P2.7.7	Earth fault protection	0	3		2		703	1 = Warning
P2.7.8	Thermal protection of the motor	0	3		2		704	2 = Fault, stop acc. to 2.4.7 3 = Fault, stop by coasting
P2.7.9	Motor ambient temperature factor	-100.0	100.0	%	0.0		705	
P2.7.10	Motor cooling factor at zero speed	0.0	150.0	%	40.0		706	
P2.7.11	Motor thermal time constant	1	200	min	Varies		707	
P2.7.12	Motor duty cycle	0	150	%	100		708	
P2.7.13	Stall protection	0	3		1		709	0 = No response 1 = Warning 2 = Fault, stop acc. to 2.4.7 3 = Fault, stop by coasting
P2.7.14	Stall current	0.00	2 x I <sub>H</sub>	A	I <sub>H</sub>		710	
P2.7.15	Stall time limit	1.00	120.00	s	15.00		711	
P2.7.16	Stall frequency limit	1.0	P2.1.2	Hz	25.00		712	
P2.7.17	Underload protection	0	3		0		713	0 = No response 1 = Warning 2 = Fault, stop acc. to 2.4.7 3 = Fault, stop by coasting
P2.7.18	UP From Torque	10.0	150.0	%	50.0		714	
P2.7.19	UP Zero frequency load	5.0	150.0	%	10.0		715	
P2.7.20	Underload protection time limit	2.00	600.00	s	20.00		716	
P2.7.21	Response to thermistor fault	0	3		2		732	0 = No response
P2.7.22	Response to fieldbus fault	0	3		2		733	1 = Warning
P2.7.23	Response to slot fault	0	3		2		734	2 = Fault, stop acc. to 2.4.7 3 = Fault, stop by coasting



Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.7.24	No. of PT100 inputs	0	5		0		739	0 = Not used 1 = Channel 1 2 = Channel 1 & 2 3 = Channel 1 & 2 & 3 4 = Channel 2 & 3 5 = Channel 3
P2.7.25	Response to PT100 fault	0	3		0		740	0 = No response 1 = Warning 2 = Fault, stop acc. to 2.4.7 3 = Fault, stop by coasting
P2.7.26	PT100 warning limit	-30.0	200.0	°C	120.0		741	
P2.7.27	PT100 fault limit	-30.0	200.0	°C	130.0		742	

### 6.4.9 Autorestart Parameters (Control Panel: Menu M2 -> G2.8)

**Table 43: Autorestart Parameters, G2.8**

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.8.1	Wait time	0.10	10.00	s	0.50		717	
P2.8.2	Trial time	0.00	60.00	s	30.00		718	
P2.8.3	Start function	0	2		0		719	0 = Ramp 1 = Flying start 2 = According to P2.4.6
P2.8.4	Number of tries after undervoltage trip	0	10		0		720	
P2.8.5	Number of tries after overvoltage trip	0	10		0		721	
P2.8.6	Number of tries after overcurrent trip	0	3		0		722	
P2.8.7	Number of tries after 4mA reference trip	0	10		0		723	
P2.8.8	Number of tries after motor temperature fault trip	0	10		0		726	
P2.8.9	Number of tries after external fault trip	0	10		0		725	
P2.8.10	Number of tries after underload fault trip	0	10		0		738	

### 6.4.10 Keypad Control (Control Panel: Menu M3)

The parameters for the selection of control place and direction on the keypad are listed below. See the *Keypad control* menu in the User Manual of the product.

**Table 44: Keypad Control Parameters, M3**

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P3.1	Control place	1	3		1		125	1 = I/O terminal 2 = Keypad 3 = Fieldbus
P3.2	Keypad reference	P2.1.1	P2.1.2	Hz	0.00			
P3.3	Direction (on keypad)	0	1		0		123	0 = Forward 1 = Reverse
P3.4	PID reference	0.00	100.00	%	0.00		167	
P3.5	PID reference 2	0.00	100.00	%	0.00		168	
R3.4	Stop button	0	1		1		114	0 = Limited function of Stop button 1 = Stop button always enabled

### 6.4.11 System Menu (Control Panel: Menu M6)

For more information related to the general use of the AC drive, such as selecting application and language, customized parameter sets, or hardware and software, see the User Manual of the product.

### 6.4.12 Expander Boards (Control Panel: Menu M7)

The *M7* menu shows the expander and option boards attached to the control board and board-related information. For more information, see the User Manual of the product.

## 7 Multi-purpose Control Application

### 7.1 Introduction to Multi-purpose Control Application

Select the Multi-purpose Control Application in menu *M6* on page *S6.2*.

The Multi-purpose Control application provides a wide range of parameters for controlling motors. It can be used for various kinds of different processes, where wide flexibility of I/O signals is needed and PID control is not necessary. When PID control functions are needed, use the PID Control Application or Pump and Fan Control Application).

The frequency reference can be selected, for example, from the analog inputs, joystick control, motor potentiometer and from a mathematical function of the analog inputs. There are parameters also for Fieldbus communication. If digital inputs are programmed for multi-step speeds and jogging speed, these functions can be also selected.

- The digital inputs and all the outputs are freely programmable and the application supports all I/O-boards.

#### Extra functions:

- Analog input signal range selection
- Two frequency limit supervisions
- Torque limit supervision
- Reference limit supervision
- Second ramps and S-shape ramp programming
- Programmable Start/Stop and Reverse logic
- DC brake at start and stop
- Three prohibit frequency areas
- Programmable U/f curve and switching frequency
- Auto restart
- Motor thermal and stall protection: fully programmable; off, warning, fault
- Motor underload protection
- Input and output phase supervision
- Joystick hysteresis
- Sleep function

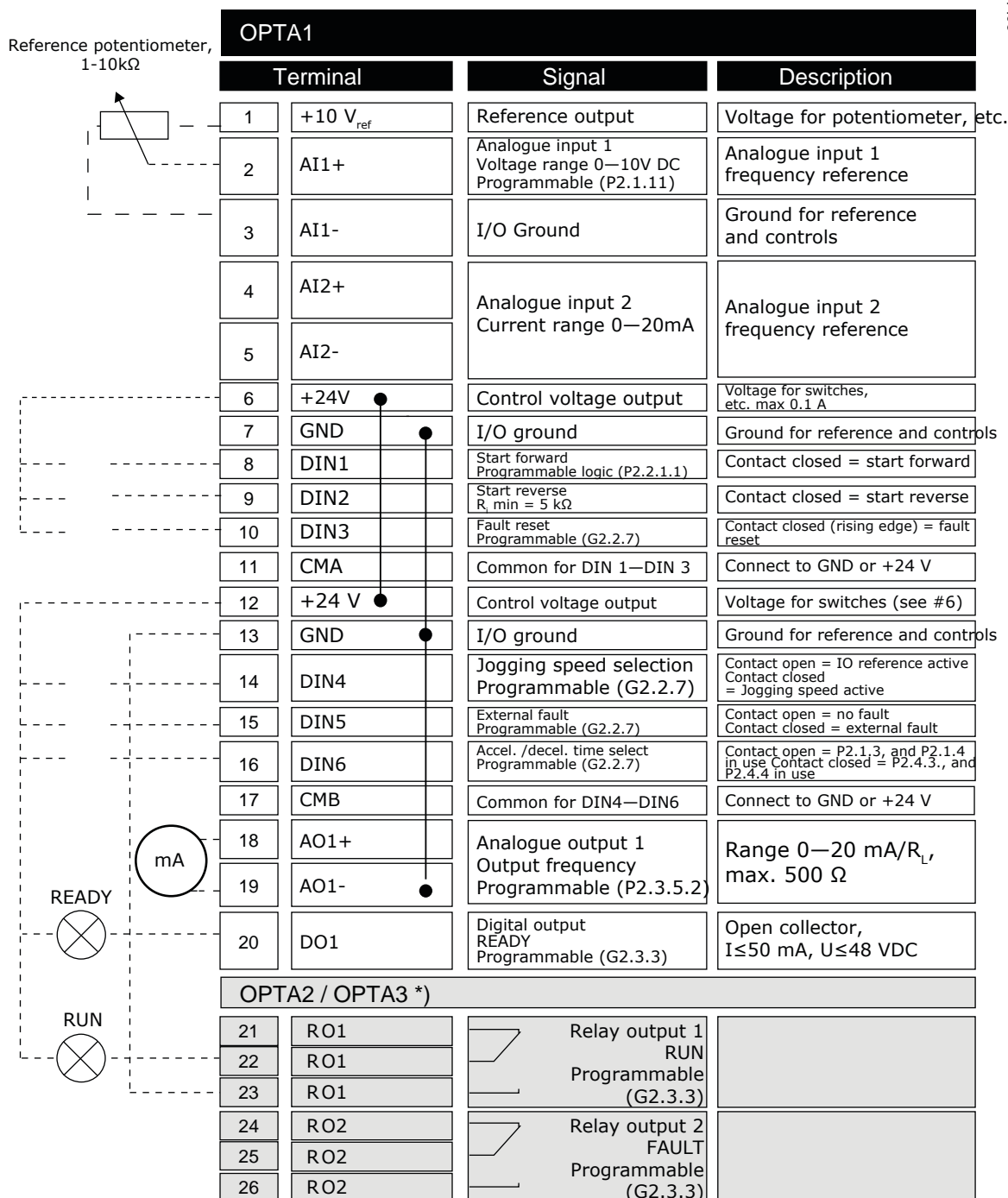
#### VACON NXP functions:

- Power limit functions
- Different power limits for motoring and generating side
- Master Follower function
- Different torque limits for motoring and generating side
- Cooling monitor input from heat exchange unit
- Brake monitoring input and actual current monitor for immediate brake close.
- Separate speed control tuning for different speeds and loads
- Inching function two different references
- Possibility to connect the FB Process data to any parameter and some monitoring values
- Identification parameter can be adjusted manually

The parameters of the Multi-purpose Control Application are explained in Chapter Parameter descriptions of this manual. The explanations are arranged according to the individual ID number of the parameter.

7.2 Control I/O in Multi-purpose Control Application

e30bh094.10



\* The option board A3 has no terminal for open contact on its second relay output (terminal 24 is missing).

Illustration 17: Default I/O Configuration in Multi-purpose Control Application

See jumper selections in [illustration 18](#). More information in the User Manual of the product.

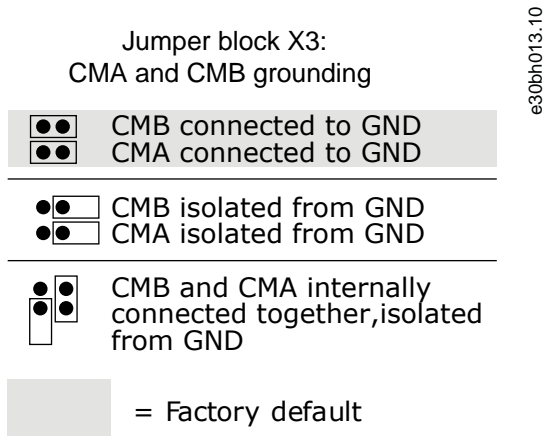


Illustration 18: Jumper Selections

### 7.3 Control Signal Logic in Multi-purpose Control Application

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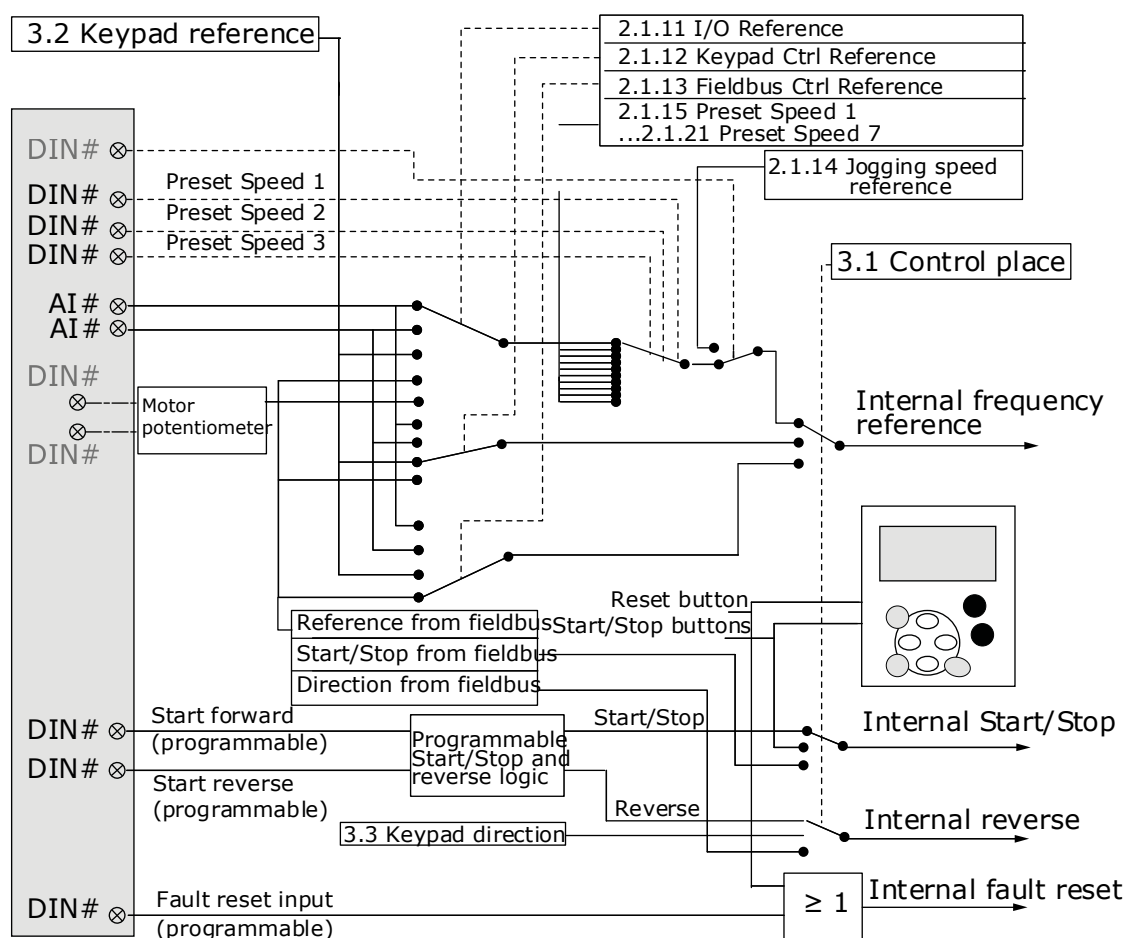


Illustration 19: Control Signal Logic of the Multi-purpose Control Application

### 7.4 Parameter Lists for Multi-purpose Control Application

#### 7.4.1 Monitoring Values (Control Panel: Menu M1)

The monitoring values are the actual values of parameters and signals as well as statuses and measurements. Monitoring values cannot be edited.

Table 45: Monitoring Values, VACON® NXS Drives

Index	Monitoring value	Unit	Form	ID	Description
V1.1	Output frequency	Hz	###	1	
V1.2	Frequency reference	Hz	###	25	
V1.3	Motor speed	RPM	#	2	
V1.4	Motor current	A	Varies	3	

Index	Monitoring value	Unit	Form	ID	Description
V1.5	Motor torque	%	##	4	
V1.6	Motor shaft power	%	##	5	
V1.7	Motor voltage	V	##	6	
V1.8	DC-link voltage	V	#	7	
V1.9	Unit temperature	°C	#	8	
V1.10	Motor temperature	%	##	9	
V1.11	Analog input 1	V/mA	###	13	
V1.12	Analog input 2	V/mA	###	14	
V1.13	DIN 1, 2, 3			15	
V1.14	DIN 4, 5, 6			16	
V1.15	Analog output 1	V/mA	###	26	
V1.16	Analog input 3	V/mA	###	27	
V1.17	Analog input 4	V/mA	###	28	
V1.18	Torque reference	%	##	18	
V1.19	Sensor max temp.	°C	##	42	
G1.20	Multimonitoring items				
V1.21.1	Current	A	Varies	1113	
V1.21.2	Torque	%	##	1125	
V1.21.3	DC Voltage	V	#	44	
V1.21.4	Status Word			43	See <a href="#">table 54</a> .
V1.21.5	Fault History		#	37	
V1.21.6	Motor Current	A	##	45	
V1.21.7	Warning			74	
V1.21.8	Sensor 1 Temp	°C	##	50	
V1.21.9	Sensor 2 Temp	°C	##	51	
V1.21.10	Sensor 3 Temp	°C	##	52	
V1.21.25	Sensor 4 Temp	°C	##	69	
V1.21.26	Sensor 5 Temp	°C	##	70	
V1.21.27	Sensor 6 Temp	°C	##	71	

**Table 46: Monitoring Values, VACON® NXP Drives**

Index	Monitoring value	Unit	Form	ID	Description
V1.1	Output frequency	Hz	###	1	
V1.2	Frequency reference	Hz	###	25	
V1.3	Motor speed	RPM	#	2	

Index	Monitoring value	Unit	Form	ID	Description
V1.4	Motor current	A	Varies	3	
V1.5	Motor torque	%	##	4	
V1.6	Motor shaft power	%	##	5	
V1.7	Motor voltage	V	##	6	
V1.8	DC-link voltage	V	#	7	
V1.9	Unit temperature	°C	#	8	
V1.10	Motor temperature	%	##	9	
V1.11 <sup>(1)</sup>	Analog input 1	V/mA	###	13	
V1.12 <sup>(1)</sup>	Analog input 2	V/mA	###	14	
V1.13	DIN 1, 2, 3			15	
V1.14	DIN 4, 5, 6			16	
V1.15	Analog output 1	V/mA	###	26	
V1.16 <sup>(1)</sup>	Analog input 3	V/mA	###	27	
V1.17 <sup>(1)</sup>	Analog input 4	V/mA	###	28	
V1.18	Torque reference	%	##	18	
V1.19	Sensor max temp.	°C	##	42	
G1.20	Multimonitoring items				
V1.21.1	Current	A	Varies	1113	
V1.21.2	Torque	%	##	1125	
V1.21.3	DC Voltage	V	#	44	
V1.21.4	Status Word			43	See <a href="#">table 54</a>
V1.21.5	Encoder 1 Frequency	Hz	###	1124	
V1.21.6	Shaft Rounds	r	#	1170	See ID 1090.
V1.21.7	Shaft Angle	Deg	##	1169	See ID 1090.
V1.21.8	Sensor 1 Temp	°C	##	50	
V1.21.9	Sensor 2 Temp	°C	##	51	
V1.21.10	Sensor 3 Temp	°C	##	52	
V1.21.11	Encoder 2 Frequency	Hz	###	53	
V1.21.12	Absolute encoder position		#	54	
V1.21.13	Absolute encoder rotations		#	55	
V1.21.14	ID Run Status		#	49	
V1.21.15	PolePairNumber		#	58	
V1.21.16	Analog input 1	%	###	59	
V1.21.17	Analog input 2	%	###	60	
V1.21.18 <sup>(1)</sup>	Analog input 3	%	###	61	



Index	Monitoring value	Unit	Form	ID	Description
V1.21.19 <sup>(1)</sup>	Analog input 4	%	###	62	
V1.21.20	Analog output 2	%	###	31	
V1.21.21	Analog output 3	%	###	32	
V1.21.22	Final Frequency Reference Closed Loop	Hz	###	1131	
V1.21.23	Step Response	Hz	####	1132	
V1.21.24	Output power	kW	Varies	1508	
V1.21.25	Sensor 4 Temp	°C	##	69	
V1.21.26	Sensor 5 Temp	°C	##	70	
V1.21.27	Sensor 6 Temp	°C	##	71	
V1.22.1 <sup>(1)</sup>	Fieldbus control word			1160	
V1.22.2 <sup>(1)</sup>	Fieldbus speed reference	%	###	875	
V1.22.3 <sup>(1)</sup>	Fieldbus actual speed	%	###	865	
V1.22.4 <sup>(1)</sup>	FB torque reference	%	##	1140	
V1.22.5	FB limit scaling	%	###	46	
V1.22.6	FB adjust reference	%	###	47	
V1.22.7	FB analog output	%	###	48	
V1.22.8	Fault History		#	37	
V1.22.9	Motor Current to FB	A	##	45	
V1.22.10	DIN StatusWord 1			56	See <a href="#">table 48</a>
V1.22.11	DIN StatusWord 2			57	See <a href="#">table 48</a>
V1.22.12	Warning			74	
V1.22.13	Fault Word1			1172	See <a href="#">table 49</a>
V1.22.14	Fault Word2			1173	See <a href="#">table 50</a>
V1.22.15	Alarm Word1			1174	See <a href="#">table 51</a>
V1.22.16	FB Mode SlotD			219	0 = Normal
V1.22.17	FB Mode SlotE			220	1 = Extended 2 = Fast 3 = Fast with fast PD 4 = Fast Safety
V1.22.18.1	Fieldbus process data in 1			221	
V1.22.18.2	Fieldbus process data in 2			222	
V1.22.18.3	Fieldbus process data in 3			223	
V1.22.18.4	Fieldbus process data in 4			224	
V1.22.18.5	Fieldbus process data in 5			225	

Index	Monitoring value	Unit	Form	ID	Description
V1.22.18.6	Fieldbus process data in 6			226	
V1.22.18.7	Fieldbus process data in 7			227	
V1.22.18.8	Fieldbus process data in 8			228	
V1.22.18.9 <sup>(2)</sup>	Fieldbus process data in 9			229	
V1.22.18.10 <sup>(2)</sup>	Fieldbus process data in 10			230	
V1.22.18.11 <sup>(2)</sup>	Fieldbus process data in 11			231	
V1.22.18.12 <sup>(2)</sup>	Fieldbus process data in 12			232	
V1.22.18.13 <sup>(2)</sup>	Fieldbus process data in 13			233	
V1.22.18.14 <sup>(2)</sup>	Fieldbus process data in 14			234	
V1.22.18.15 <sup>(2)</sup>	Fieldbus process data in 15			235	
V1.22.18.16 <sup>(2)</sup>	Fieldbus process data in 16			236	
V1.22.18.17	Fieldbus process data out 1			237	
V1.22.18.18	Fieldbus process data out 2			238	
V1.22.18.19	Fieldbus process data out 3			239	
V1.22.18.20	Fieldbus process data out 4			240	
V1.22.18.21	Fieldbus process data out 5			241	
V1.22.18.22	Fieldbus process data out 6			242	
V1.22.18.23	Fieldbus process data out 7			243	
V1.22.18.24	Fieldbus process data out 8			244	
V1.22.18.25 <sup>(2)</sup>	Fieldbus process data out 9			245	
V1.22.18.26 <sup>(2)</sup>	Fieldbus process data out 10			246	
V1.22.18.27 <sup>(2)</sup>	Fieldbus process data out 11			247	
V1.22.18.28 <sup>(2)</sup>	Fieldbus process data out 12			248	
V1.22.18.29 <sup>(2)</sup>	Fieldbus process data out 13			249	
V1.22.18.30 <sup>(2)</sup>	Fieldbus process data out 14			250	
V1.22.18.31 <sup>(2)</sup>	Fieldbus process data out 15			251	
V1.22.18.32 <sup>(2)</sup>	Fieldbus process data out 16			252	
V1.23.1	SystemBus System Status			1601	See <a href="#">table 52</a>
V1.23.2	Total current	A	Varies	83	
V1.23.3.1	Motor current D1	A	Varies	1616	
V1.23.3.2	Motor current D2	A	Varies	1605	
V1.23.3.3	Motor current D3	A	Varies	1606	
V1.23.3.4	Motor current D4	A	Varies	1607	
V1.23.4.1	StatusWord D1			1615	See <a href="#">table 53</a>

Index	Monitoring value	Unit	Form	ID	Description
V1.23.4.2	StatusWord D2			1602	See <a href="#">table 53</a>
V1.23.4.3	StatusWord D3			1603	See <a href="#">table 53</a>
V1.23.4.4	StatusWord D4			1604	See <a href="#">table 53</a>

<sup>1</sup> These monitoring values can be controlled from the fieldbus.

<sup>2</sup> Visible only when the option board installed in the AC drive supports 16 Process data items.

**Table 47: Digital Input Statuses: ID15 and ID16**

	DIN 1/DIN 2/DIN 3 status	DIN 4/DIN 5/DIN 6 status
b0	DIN 3	DIN 6
b1	DIN 2	DIN 5
b2	DIN 1	DIN 4

**Table 48: Digital Input Statuses: ID56 and ID57**

	DIN StatusWord 1	DIN StatusWord 2
b0	DIN: A.1	DIN: C.5
b1	DIN: A.2	DIN: C.6
b2	DIN: A.3	DIN: D.1
b3	DIN: A.4	DIN: D.2
b4	DIN: A.5	DIN: D.3
b5	DIN: A.6	DIN: D.4
b6	DIN: B.1	DIN: D.5
b7	DIN: B.2	DIN: D.6
b8	DIN: B.3	DIN: E.1
b9	DIN: B.4	DIN: E.2
b10	DIN: B.5	DIN: E.3
b11	DIN: B.6	DIN: E.4
b12	DIN: C.1	DIN: E.5
b13	DIN: C.2	DIN: E.6
b14	DIN: C.3	
b15	DIN: C.4	

**Table 49: Fault Word 1, ID1172**

	Fault	Comment
b0	Overcurrent or IGBT	F1, F31, F41
b1	Overvoltage	F2

	Fault	Comment
b2	Undervoltage	F9
b3	Motor stalled	F15
b4	Earth fault	F3
b5	Motor underload	F17
b6	Drive overtemperature	F14
b7	Motor overtemperature	F16, F56, F29, F65
b8	Input phase	F10
b11	Keypad or PC control	F52
b12	Fieldbus	F53
b13	SystemBus	F59
b14	Slot	F54
b15	4 mA	F50

Table 50: Fault Word 2, ID1173

	Fault	Comment
b2	Encoder	F43
b4		
b6	External	F51
b9	IGBT	F31, F41
b10	Brake	F58
b14	Main switch open	F64
b15		

Table 51: Alarm Word 1, ID1174

	Warning	Comment
b0	Motor stalled	W15
b1	Motor overtemperature	W16, W29, W56, W65
b2	Motor underload	W17
b3	Input phase loss	W10
b4	Output phase loss	W11
b8	Drive overtemperature warning	W14
b9	Analog input < 4 mA	W50
b10	Not used	
b13	Not used	
b14	Mechanical brake	W58

	Warning	Comment
b15	Keypad or PC Fault/Warning	W52

**Table 52: SystemBus Status Word, ID1601**

	False	True
b0		Reserved
b1		Drive 1 Ready
b2		Drive 1 Running
b3		Drive 1 Fault
b4		Reserved
b5		Drive 2 Ready
b6		Drive 2 Running
b7		Drive 2 Fault
b8		Reserved
b9		Drive 3 Ready
b10		Drive 3 Running
b11		Drive 3 Fault
b12		Reserved
b13		Drive 4 Ready
b14		Drive 4 Running
b15		Drive 4 Fault

**Table 53: Follower Drive Status Word**

	False	True
b0	Flux not ready	Flux ready (>90%)
b1	Not in Ready state	Ready
b2	Not running	Running
b3	No fault	Fault
b4		Charge switch state
b5		
b6	Run disabled	Run enable
b7	No warning	Warning
b8		
b9		
b10		
b11	No DC brake	DC brake is active

	False	True
b12	No run request	Run request
b13	No limit controls active	Limit control active
b14	External brake control OFF	External brake control ON
b15		Heartbeat

Application Status Word combines different drive statuses to one data word (see Monitoring Value V1.21.4 Status Word). Status Word is visible on keypad in Multi-Purpose application only. The Status Word of any other application can be read with the VACON® NCDrive PC software.

**Table 54: Application Status Word Content**

Status Word	Standard Application	Local/Remote Control Application	Multi-Step Control Application	PID Control Application	Multi-Purpose Control Application	Pump and Fan Control Application
b0						
b1	Ready	Ready	Ready	Ready	Ready	Ready
b2	Run	Run	Run	Run	Run	Run
b3	Fault	Fault	Fault	Fault	Fault	Fault
b4						
b5				No EMStop (VACON® NXP)		
b6	Run Enable	Run Enable	Run Enable	Run Enable	Run Enable	Run Enable
b7	Warning	Warning	Warning	Warning	Warning	Warning
b8						
b9						
b10						
b11	DC Brake	DC Brake	DC Brake	DC Brake	DC Brake	DC Brake
b12	Run request	Run request	Run request	Run request	Run request	Run request
b13	Limit control	Limit control	Limit control	Limit control	Limit control	Limit control
b14					Brake control	Aux 1
b15		Place B is active		PID active		Aux 2

## 7.4.2 Basic Parameters (Control Panel: Menu M2 -> G2.1)

**Table 55: Basic Parameters G2.1**

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.1.1	Min frequency	0.00	P2.1.2	Hz	0.00		101	
P2.1.2	Max frequency	P2.1.1	320.00	Hz	50.00		102	
P2.1.3	Acceleration time 1	0.1	3000.0	s	3.0		103	

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.1.4	Deceleration time 1	0.1	3000.0	s	3.0		104	
P2.1.5	Current limit	Varies	Varies	A	0.00		107	
P2.1.6 <sup>(1)</sup>	Nominal voltage of the motor	180	690	V	NX2: 230 V NX5: 400 V NX6: 690 V		110	
P2.1.7 <sup>(1)</sup>	Nominal frequency of the motor	8.00	320.00	Hz	50.00		111	
P2.1.8 <sup>(1)</sup>	Nominal speed of the motor	24	20 000	RPM	1440		112	
P2.1.9 <sup>(1)</sup>	Nominal current of the motor	Varies	Varies	A	5.40		113	
P2.1.10	Motor cos phi	0.30	1.00		0.85		120	
P2.1.11	I/O reference	0	15/16		0		117	0 = AI1 1 = AI2 2 = AI1+AI2 3 = AI1-AI2 4 = AI2-AI1 5 = AI1xAI2 6 = AI1 Joystick 7 = AI2 Joystick 8 = Keypad 9 = Fieldbus 10 = Motor potentiometer 11 = AI1, AI2 minimum 12 = AI1, AI2 maximum 13 = Max frequency 14 = AI1/AI2 selection 15 = Encoder 1 16 = Encoder 2 (VACON® NXP only)

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.1.12	Keypad control reference	0	9		8		121	0 = AI1
P2.1.13	Fieldbus control reference	0	9		9		122	1 = AI2 2 = AI1+AI2 3 = AI1-AI2 4 = AI2-AI1 5 = AI1xAI2 6 = AI1 Joystick 7 = AI2 Joystick 8 = Keypad 9 = Fieldbus
P2.1.14	Jogging speed reference	0.00	P2.1.2	Hz	5.00		124	See <a href="#">10.157 (ID 413) Jogging Speed</a>
P2.1.15	Preset speed 1	0.00	P2.1.2	Hz	10.00		105	
P2.1.16	Preset speed 2	0.00	P2.1.2	Hz	15.00		106	
P2.1.17	Preset speed 3	0.00	P2.1.2	Hz	20.00		126	
P2.1.18	Preset speed 4	0.00	P2.1.2	Hz	25.00		127	
P2.1.19	Preset speed 5	0.00	P2.1.2	Hz	30.00		128	
P2.1.20	Preset speed 6	0.00	P2.1.2	Hz	40.00		129	
P2.1.21	Preset speed 7	0.00	P2.1.2	Hz	50.00		130	

<sup>1</sup> Parameter value can only be changed after the AC drive has been stopped.



## 7.4.3 Input Signals

Table 56: Basic Settings (Control Panel: Menu M2 -&gt; G2.2.1)

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.2.1.1 <sup>(1)</sup>	Start/Stop logic	0	7		0		300	<p><b>Logic = 0</b></p> <p>Ctrl sgn 1 = Start forward</p> <p>Ctrl sgn 2 = Start reverse</p> <p><b>Logic = 1</b></p> <p>Ctrl sgn1 = Start/ Stop</p> <p>Ctrl sgn 2 = Reverse</p> <p><b>Logic = 2</b></p> <p>Ctrl sgn 1 = Start/ Stop</p> <p>Ctrl sgn 2 = Run enable</p> <p><b>Logic = 3</b></p> <p>Ctrl sgn 1 = Start pulse (edge)</p> <p>Ctrl sgn 2 = Stop pulse</p> <p><b>Logic = 4</b></p> <p>Ctrl sgn 1 = Start</p> <p>Ctrl sgn 2 = Motor potentiometer UP</p> <p><b>Logic = 5</b></p> <p>Ctrl sgn 1 = Forward pulse (edge)</p> <p>Ctrl sgn 2 = Reverse pulse (edge)</p> <p><b>Logic = 6</b></p> <p>Ctrl sgn 1 = Start pulse (edge)</p> <p>Ctrl sgn 2 = Reverse pulse</p> <p><b>Logic = 7</b></p> <p>Ctrl sgn 1 = Start pulse (edge)</p> <p>Ctrl sgn 2 = Enable pulse</p>
P2.2.1.2 <sup>(1)</sup>	Motor potentiometer ramp time	0.1	2000.0	Hz/s	10.0		331	

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.2.1.3 <sup>(1)</sup>	Motor potentiometer frequency reference memory reset	0	2		1		367	0 = No reset 1 = Reset if stopped or powered down 2 = Reset if powered down
P2.2.1.4 <sup>(1)</sup>	Adjust input	0	5		0		493	0 = Not used 1 = AI1 2 = AI2 3 = AI3 4 = AI4 5 = Fieldbus (see group G2.9)
P2.2.1.5	Adjust minimum	0.0	100.0	%	0.0		494	
P2.2.1.6	Adjust maximum	0.0	100.0	%	0.0		495	

<sup>1</sup> Parameter value can only be changed after the AC drive has been stopped.

**Table 57: Analog Input 1 (Control Panel: Menu M2 -> G2.2.2)**

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.2.2.1 <sup>(1)</sup>	AI1 signal selection	0.1	E.10		A.1		377	
P2.2.2.2	AI1 filter time	0.00	320.00	s	0.10		324	
P2.2.2.3 <sup>(2)</sup>	AI1 signal range	0	3		0		320	0 = 0–10 V (0–20 mA) 1 = 2–10 V (4–20 mA) 2 = -10V...+10 V 3 = Custom range
P2.2.2.4	AI1 custom minimum setting	-160.00	160.00	%	0.00		321	
P2.2.2.5	AI1 custom maximum setting	-160.00	160.00	%	100.00		322	
P2.2.2.6	AI1 reference scaling, minimum value	0.00	320.00	Hz	0.00		303	
P2.2.2.7	AI1 reference scaling, maximum value	0.00	320.00	Hz	0.00		304	
P2.2.2.8	AI1 joystick hysteresis	0.00	20.00	%	0.00		384	
P2.2.2.9	AI1 sleep limit	0.00	100.00	%	0.00		385	
P2.2.2.10	AI1 sleep delay	0.00	320.00	s	0.00		386	
P2.2.2.11	AI1 joystick offset	-100.00	100.00	%	0.00		165	

<sup>1</sup> Apply the Terminal to Function method (TTF) to these parameters (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#))

<sup>2</sup> Remember to place jumpers of block X2 according to the selection (0, 1, 2, or 3). See the User Manual of the product.

**Table 58: Analog Input 2 (Control Panel: Menu M2 -> G2.2.3)**

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.2.3.1 <sup>(1)</sup>	AI2 signal selection	0.1	E.10		A.2		388	
P2.2.3.2	AI2 filter time	0.00	320.00	s	0.10		329	
P2.2.3.3 <sup>(2)</sup>	AI2 signal range	0	3		1		325	0 = 0–10 V (0–20mA) 1 = 2–10 V (4–20 mA) 2 = -10V...+10 V 3 = Custom range
P2.2.3.4	AI2 custom minimum setting	-160.00	160.00	%	20.00		326	
P2.2.3.5	AI2 custom maximum setting	-160.00	160.00	%	100.00		327	
P2.2.3.6	AI2 reference scaling, minimum value	0.00	320.00	Hz	0.00		393	
P2.2.3.7	AI2 reference scaling, maximum value	0.00	320.00	Hz	0.00		394	
P2.2.3.8	AI2 joystick hysteresis	0.00	20.00	%	0.00		395	
P2.2.3.9	AI2 sleep limit	0.00	100.00	%	0.00		396	
P2.2.3.10	AI2 sleep delay	0.00	320.00	s	0.00		397	
P2.2.3.11	AI2 joystick offset	-100.00	100.00	%	0.00		166	

<sup>1</sup> Apply the Terminal to Function method (TTF) to these parameters (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#))

<sup>2</sup> Remember to place jumpers of block X2 according to the selection (0, 1, 2 or 3). See the User Manual of the product.

**Table 59: Analog Input 3 (Control Panel: Menu M2 -> G2.2.4)**

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.2.4.1 <sup>(1)</sup>	AI3 signal selection	0.1	E.10		0.1		141	
P2.2.4.2	AI3 filter time	0.00	320.00	s	0.00		142	0 = No filtering
P2.2.4.3 <sup>(2)</sup>	AI3 signal range	0	3		0		143	0 = 0–10 V (0–20mA) 1 = 2–10 V (4–20 mA) 2 = -10V...+10 V 3 = Custom range
P2.2.4.4	AI3 custom minimum setting	-160.00	160.00	%	0.00		144	
P2.2.4.5	AI3 custom maximum setting	-160.00	160.00	%	100.00		145	
P2.2.4.6	AI3 signal inversion	0	1		0		151	0 = Not inverted 1 = Inverted

<sup>1</sup> Apply the Terminal to Function method (TTF) to these parameters (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#))

<sup>2</sup> Remember to place jumpers of block X2 according to the selection (0, 1, 2 or 3). See the User Manual of the product.

**Table 60: Analog Input 4 (Control Panel: Menu M2 -> G2.2.5)**

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.2.5.1 <sup>(1)</sup>	AI4 signal selection	0.1	E.10		0.1		152	
P2.2.5.2	AI4 filter time	0.00	320.00	s	0.00		153	0 = No filtering
P2.2.5.3 <sup>(2)</sup>	AI4 signal range	0	3		1		154	0 = 0–10 V (0–20mA) 1 = 2–10 V (4–20 mA) 2 = -10V...+10 V 3 = Custom range
P2.2.5.4	AI4 custom minimum setting	-160.00	160.00	%	20.00		155	
P2.2.5.5	AI4 custom maximum setting	-160.00	160.00	%	100.00		156	
P2.2.5.6	AI4 signal inversion	0	1		0		162	0 = Not inverted 1 = Inverted

<sup>1</sup> Apply the Terminal to Function method (TTF) to these parameters (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#))

<sup>2</sup> Remember to place jumpers of block X2 according to the selection (0, 1, 2 or 3). See the User Manual of the product.

**Table 61: Free Analog Input, Signal Selection (Control Panel: Menu M2 -> G2.2.6)**

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.2.6.1	Scaling of current limit	0	5		0		399	0 = Not used
P2.2.6.2	Scaling of DCbraking current	0	5		0		400	1 = AI1
P2.2.6.3	Scaling of acc./ dec. times	0	5		0		401	2 = AI2
P2.2.6.4	Scaling of torque supervision limit	0	5		0		402	3 = AI3
P2.2.6.5	Scaling of torque limit	0	5		0		485	4 = AI4 5 = FB Limit Scaling See group G2.9
<b>VACON® NXP drives only</b>								
P2.2.6.6	Scaling of generator torque limit	0	5		0		1087	As parameter P2.2.6.1
P2.2.6.7	Scaling of motoring power limit	0	5		0		179	
P2.2.6.8	Scaling of generator power limit	0	5		0		1088	

**Table 62: Digital Inputs (Control Panel: Menu M2 -> G2.2.4)**

Index	Parameter	Min	Default	Cust	ID	Description
P2.2.7.1 <sup>(1)</sup>	Start signal 1	0.1	A.1		403	See P2.2.1.1.
P2.2.7.2 <sup>(1)</sup>	Start signal 2	0.1	A.2		404	See P2.2.1.1.
P2.2.7.3 <sup>(1)</sup>	Run enable	0.1	0.2		407	

Index	Parameter	Min	Default	Cust	ID	Description
P2.2.7.4 <sup>(1)</sup>	Reverse	0.1	0.1		412	
P2.2.7.5 <sup>(1)</sup>	Preset speed 1	0.1	0.1		419	See preset speeds in Basic Parameters (G2.1).
P2.2.7.6 <sup>(1)</sup>	Preset speed 2	0.1	0.1		420	
P2.2.7.7 <sup>(1)</sup>	Preset speed 3	0.1	0.1		421	
P2.2.7.8 <sup>(1)</sup>	Motor potentiometer reference DOWN	0.1	0.1		417	
P2.2.7.9 <sup>(1)</sup>	Motor potentiometer reference UP	0.1	0.1		418	
P2.2.7.10 <sup>(1)</sup>	Fault reset	0.1	A.3		414	
P2.2.7.11 <sup>(1)</sup>	External fault (close)	0.1	A.5		405	
P2.2.7.12 <sup>(1)</sup>	External fault (open)	0.1	0.2		406	
P2.2.7.13 <sup>(1)</sup>	Acc/Dec time selection	0.1	A.6		408	
P2.2.7.14 <sup>(1)</sup>	Acc/Dec prohibit	0.1	0.1		415	
P2.2.7.15 <sup>(1)</sup>	DC braking	0.1	0.1		416	
P2.2.7.16 <sup>(1)</sup>	Jogging speed	0.1	A.4		413	
P2.2.7.17 <sup>(1)</sup>	AI1/AI2 selection	0.1	0.1		422	
P2.2.7.18 <sup>(1)</sup>	Control from I/O terminal	0.1	0.1		409	
P2.2.7.19 <sup>(1)</sup>	Control from keypad	0.1	0.1		410	
P2.2.7.20 <sup>(1)</sup>	Control from fieldbus	0.1	0.1		411	
P2.2.7.21 <sup>(1)</sup>	Parameter set 1/set 2 selection	0.1	0.1		496	
P2.2.7.22 <sup>(1)</sup>	Motor control mode 1/2	0.1	0.1		164	
<b>VACON® NXP drives only</b>						
P2.2.7.23 <sup>(1)</sup>	Cooling monitor	0.1	0.2		750	
P2.2.7.24 <sup>(1)</sup>	External brake acknowledge	0.1	0.2		1210	
P2.2.7.26 <sup>(1)</sup>	Enable inching	0.1	0.1		532	
P2.2.7.27 <sup>(1)</sup>	Inching reference 1	0.1	0.1		530	
P2.2.7.28 <sup>(1)</sup>	Inching reference 2	0.1	0.1		531	
P2.2.7.29 <sup>(1)</sup>	Reset encoder counter	0.1	0.1		1090	
P2.2.7.30 <sup>(1)</sup>	Emergency stop	0.1	0.2		1213	
P2.2.7.31 <sup>(1)</sup>	Master Follower mode 2	0.1	0.1		1092	See <a href="#">10.518 Master/Follower Function</a> and parameters P2.11.1- P2.11.7.
P2.2.7.32 <sup>(1)</sup>	Input switch acknowledgement	0.1	0.2		1209	
P2.2.7.33 <sup>(1)</sup>	Active filter fault input	0.1	0.1		214	

<sup>1</sup> Apply the Terminal to Function method (TTF) to these parameters (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#))

cc = closing contact

oc = opening contact

## 7.4.4 Output Signals

Table 63: Delayed Digital Output 1 (Control Panel: Menu M2 -> G2.3.1)

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.3.1.1 <sup>(1)</sup>	Digital output 1 signal selection	0.1	E.10		0.1		486	

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.3.1.2	Digital output 1 function	0	29		1		312	0 = Not used 1 = Ready 2 = Run 3 = Fault 4 = Fault inverted 5 = AC drive overheat warning 6 = Ext. fault or warning 7 = Ref. fault or warning 8 = Warning 9 = Reverse 10 = Jogging spd selected 11 = At speed 12 = Mot. regulator active 13 = Freq. limit 1 superv. 14 = Freq. limit 2 superv. 15 = Torque limit superv. 16 = Ref. limit supervision 17 = External brake control 18 = I/O control place act. 19 = AC drive temp. limit superv. 20 = Reference inverted 21 = Ext. brake control inverted 22 = Therm. fault or warn. 23 = On/Off control 24 = Fieldbus DIN 1 25 = Fieldbus DIN 2 26 = Fieldbus DIN 3 27 = Temp.Warning

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.3.1.2	Digital output 1 function	0	29		1		312	<b>VACON® NXS drives only:</b> 28 = Temp.Fault  <b>VACON® NXP drives only:</b> 29 = ID.Bit
P2.3.1.3	Digital output 1 on delay	0.00	320.00	s	0.00		487	
P2.3.1.4	Digital output 1 off delay	0.00	320.00	s	0.00		488	
<b>VACON® NXP drives only</b>								
P2.3.1.5	INV Delayed DO1	0	1		0		1587	0 = No 1 = Yes
P2.3.1.6	ID Bit Free DO1	0.0	200.15		0.0		1217	

<sup>1</sup> Use TTF method to program these parameters, see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#).

Table 64: Delayed Digital Output 2 (Control Panel: Menu M2 -> G2.3.2)

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.3.2.1	Digital output 2 signal selection	0.1	E.10		0.1		489	
P2.3.2.2	Digital output 2 function	0	29		0		490	See P2.3.1.2
P2.3.2.3	Digital output 2 on delay	0.00	320.00	s	0.00		491	
P2.3.2.4	Digital output 2 off delay	0.00	320.00	s	0.00		492	
<b>VACON® NXP drives only</b>								
P2.3.2.5	INV Delayed DO2	0	1		0		1588	0 = No 1 = Yes
P2.3.2.6	ID Bit Free DO2	0.0	200.15		0.0		1385	

Table 65: Digital Output Signals (Control Panel: Menu M2 -> G2.2.4)

Index	Parameter	Min	Default	Cust	ID	Description
<b>NOTICE</b>						
To avoid function overruns and to ensure flawless operation, make ABSOLUTELY sure that two functions ARE NOT CONNECTED to one and same output.						
P2.3.3.1 <sup>(1)</sup>	Ready	0.1	A.1		432	
P2.3.3.2 <sup>(1)</sup>	Run	0.1	B.1		433	
P2.3.3.3 <sup>(1)</sup>	Fault	0.1	B.2		434	
P2.3.3.4 <sup>(1)</sup>	Inverted fault	0.1	0.1		435	



Index	Parameter	Min	Default	Cust	ID	Description
P2.3.3.5 <sup>(1)</sup>	Warning	0.1	0.1		436	
P2.3.3.6 <sup>(1)</sup>	External fault	0.1	0.1		437	
P2.3.3.7 <sup>(1)</sup>	Reference fault/warning	0.1	0.1		438	
P2.3.3.8 <sup>(1)</sup>	Overtemperature warning	0.1	0.1		439	
P2.3.3.9 <sup>(1)</sup>	Reverse	0.1	0.1		440	
P2.3.3.10 <sup>(1)</sup>	Unrequested direction	0.1	0.1		441	
P2.3.3.11 <sup>(1)</sup>	At speed	0.1	0.1		442	
P2.3.3.12 <sup>(1)</sup>	Jogging speed	0.1	0.1		443	
P2.3.3.13 <sup>(1)</sup>	I/O control place	0.1	0.1		444	
P2.3.3.14 <sup>(1)</sup>	External brake control	0.1	0.1		445	See <a href="#">10.189 (ID 445) External Brake Control</a> and <a href="#">10.190 (ID 446) External Brake Control, Inverted</a> .
P2.3.3.15 <sup>(1)</sup>	External brake control, inverted	0.1	0.1		446	
P2.3.3.16 <sup>(1)</sup>	Output frequency limit 1 supervision	0.1	0.1		447	See <a href="#">10.75 (ID 315) Output Frequency Limit Supervision Function</a>
P2.3.3.17 <sup>(1)</sup>	Output frequency limit 2 supervision	0.1	0.1		448	See <a href="#">10.104 (ID 346) Output Frequency Limit 2 Supervision Function</a> .
P2.3.3.18 <sup>(1)</sup>	Reference limit supervision	0.1	0.1		449	See <a href="#">10.108 (ID 350) Reference Limit, Supervision Function</a> .
P2.3.3.19 <sup>(1)</sup>	Temperature limit supervision	0.1	0.1		450	See <a href="#">10.112 (ID 354) Frequency Converter Temperature Limit Supervision</a> .
P2.3.3.20 <sup>(1)</sup>	Torque limit supervision	0.1	0.1		451	See <a href="#">10.106 (ID 348) Torque Limit, Supervision Function</a> .
P2.3.3.21 <sup>(1)</sup>	Thermistor fault or warning	0.1	0.1		452	
P2.3.3.22 <sup>(1)</sup>	Analog input supervision limit	0.1	0.1		453	See <a href="#">10.114 (ID 356) Analog Supervision Signal</a> .
P2.3.3.23 <sup>(1)</sup>	Motor regulator activation	0.1	0.1		454	
P2.3.3.24 <sup>(1)</sup>	Fieldbus DIN 1	0.1	0.1		455	
P2.3.3.25 <sup>(1)</sup>	Fieldbus DIN 2	0.1	0.1		456	
P2.3.3.26 <sup>(1)</sup>	Fieldbus DIN 3	0.1	0.1		457	
P2.3.3.27 <sup>(1)</sup>	Fieldbus DIN 4	0.1	0.1		169	
P2.3.3.28 <sup>(1)</sup>	Fieldbus DIN 5	0.1	0.1		170	
<b>VACON® NXP drives only</b>						
P2.3.3.29 <sup>(1)</sup>	DC ready pulse	0.1	0.1		1218	
P2.3.3.30 <sup>(1)</sup>	Safe Disable Active	0.1	0.1		756	

<sup>1</sup> Use the TTF method to program these parameters. (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#))

**Table 66: Limit Settings (Control Panel: Menu M2 -> G2.3.4)**

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.3.4.1	Output frequency limit 1 supervision	0	3		0		315	0 = No supervision 1 = Low limit supervision 2 = High limit supervision 3 = Brake-on control
P2.3.4.2	Output frequency limit 1; Supervised value	0.00	320.00	Hz	0.00		316	
P2.3.4.3	Output frequency limit 2 supervision	0	4		0		346	0 = No supervision 1 = Low limit supervision 2 = High limit supervision 3 = Brake-off control 4 = Brake on/off control
P2.3.4.4	Output frequency limit 2; Supervised value	0.00	320.00	Hz	0.00		347	
P2.3.4.5	Torque limit supervision	0	3		0		348	0 = No supervision 1 = Low limit supervision 2 = High limit supervision 3 = Brake-off control
P2.3.4.6	Torque limit supervision value	-300.0	300.0	%	100.0		349	
P2.3.4.7	Reference limit supervision	0	2		0		350	0 = No supervision 1 = Low limit 2 = High limit
P2.3.4.8	Reference limit supervision value	0.0	100.0	%	0.0		351	0.0 = Min frequency 100.0 = Max frequency
P2.3.4.9	External brake-off delay	0.0	100.0	s	0.5		352	
P2.3.4.10	External brake-on delay	0.0	100.0	s	1.5		353	
P2.3.4.11	Temperature limit supervision	0	2		0		354	0 = No supervision 1 = Low limit 2 = High limit
P2.3.4.12	Temperature supervised value	-10	100	°C	40		355	

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.3.4.13	Analog supervision signal	0	4		0		356	0 = Not used 1 = AI1 2 = AI2 3 = AI3 4 = AI4
P2.3.4.14	Analogue supervision low limit	0.00	100.00	%	100.00		357	See P2.3.3.22.
P2.3.4.15	Analog supervision high limit	0.00	100.00	%	90.00		358	See P2.3.3.22.
<b>VACON® NXP drives only</b>								
P2.3.4.16	Brake On/Off Current Limit	0	2 x I <sub>H</sub>	A	0		1085	

**Table 67: Analog Output 1 (Control Panel: Menu M2 -> G2.3.5)**

Index	Parameter	Min	Max	Unit	De- fault	Cust	ID	Description
P2.3.5.1 <sup>(1)</sup>	Analog output 1 signal selection	0.1	E.10		A.1		464	

Index	Parameter	Min	Max	Unit	De- fault	Cust	ID	Description
P2.3.5.2	Analog output 1 function	0	15		1		307	0 = Not used (20 mA / 10 V) 1 = Output freq. (0- $f_{max}$ ) 2 = Freq. reference (0- $f_{max}$ ) 3 = Motor speed (0-Motor nominal speed) 4 = Motor current (0- $I_{nMotor}$ ) 5 = Motor torque (0- $T_{nMotor}$ ) 6 = Motor power (0- $P_{nMotor}$ ) 7 = Motor voltage (0- $U_{nMotor}$ ) 8 = DC-link volt (0-1000 V) 9 = AI1 10 = AI2 11 = Output freq. ( $f_{min}$ - $f_{max}$ ) 12 = Motor torque (-2...+2 $T_{Nmot}$ ) 13 = Motor power (-2...+2 $T_{Nmot}$ ) 14 = PT100 temperature 15 = FB analog output Process- Data4 (VACON® NXS)
P2.3.5.3	Analog output 1 filter time	0.00	100.00	s	1.00		308	
P2.3.5.4	Analog output 1 inversion	0	1		0		309	0 = Not inverted 1 = Inverted
P2.3.5.5	Analog output 1 scale	0	1		0		310	0 = 0 mA (0 V) 1 = 4 mA (2 V)
P2.3.5.6	Analog output 1 scale	10	1000	%	100		311	
P2.3.5.7	Analog output 1 offset	-100.00	100.00	%	0.00		375	

<sup>1</sup> Apply the Terminal to Function method (TTF) to these parameters (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#))

**Table 68: Analog Output 2 (Control Panel: Menu M2 -> G2.3.6)**

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.3.6.1 <sup>(1)</sup>	Analog output 2 signal selection	0.1	E.10		0.1		471	
P2.3.6.2	Analog output 2 function	0	15		4		472	See P2.3.5.2
P2.3.6.3	Analog output 2 filter time	0.00	10.00	s	1.00		473	
P2.3.6.4	Analog output 2 inversion	0	1		0		474	0 = Not inverted 1 = Inverted
P2.3.6.5	Analog output 2 minimum	0	1		0		475	0 = 0 mA (0 V) 1 = 4 mA (2 V)
P2.3.6.6	Analog output 2 scale	10	1000	%	100		476	
P2.3.6.7	Analog output 2 offset	-100.00	100.00	%	0.00		477	

<sup>1</sup> Use TTF method to program these parameters, see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#).

**Table 69: Analog Output 3 (Control Panel: Menu M2 -> G2.3.6)**

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.3.7.1 <sup>(1)</sup>	Analog output 3 signal selection	0.1	E.10		0.1		478	
P2.3.7.2	Analog output 3 function	0	15		5		479	See P2.3.5.2
P2.3.7.3	Analog output 3 filter time	0.00	10.00	s	1.00		480	
P2.3.7.4	Analog output 3 inversion	0	1		0		481	0 = Not inverted 1 = Inverted
P2.3.7.5	Analog output 3 minimum	0	1		0		482	0 = 0 mA (0 V) 1 = 4 mA (2 V)
P2.3.7.6	Analog output 3 scale	10	1000	%	100		483	
P2.3.7.7	Analog output 3 offset	-100.00	100.00	%	0.00		484	

<sup>1</sup> Use TTF method to program these parameters, see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#).

## 7.4.5 Drive Control Parameters (Control Panel: Menu M2 -> G2.4)

**Table 70: Drive Control Parameters, G2.4**

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.4.1	Ramp 1 shape	0.0	10.0	s	0.1		500	0 = Linear 100 = full acc/dec inc/dec times
P2.4.2	Ramp 2 shape	0.0	10.0	s	0.0		501	0 = Linear 100 = full acc/dec inc/dec times

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.4.3	Acceleration time 2	0.1	3000.0	s	1.0		502	
P2.4.4	Deceleration time 2	0.1	3000.0	s	1.0		503	
P2.4.5 <sup>(1)</sup>	Brake chopper	0	4		0		504	0 = Disabled 1 = Used when running 2 = External brake chopper 3 = Used when stopped/running 4 = Used when running (no testing)
P2.4.6	Start function	0	2		0		505	0 = Ramp 1 = Flying start 2 = Conditional flying start
P2.4.7	Stop function	0	3		0		506	0 = Coasting 1 = Ramp 2 = Ramp+Run enable coast 3 = Coast+Run enable ramp
P2.4.8	DC braking current	0.00	$I_L$	A	$0.7 \times I_H$		507	
P2.4.9	DC braking time at stop	0.00	600.00	s	0.00		508	0 = DC brake is off at stop
P2.4.10	Frequency to start DC braking during ramp stop	0.10	10.00	Hz	1.50		515	
P2.4.11	DC braking time at start	0.00	600.00	s	0.00		516	0 = DC brake is off at start
P2.4.12	Flux brake	0	1		0		520	0 = Off 1 = On
P2.4.13	Flux braking current	0.00	$I_L$	A	$I_H$		519	
<b>VACON® NXP drives only</b>								
P2.4.14	DC-brake current at stop	0	$I_L$	A	$0.1 \times I_H$		1080	
P2.4.15	Inching reference 1	-320.00	320.00	Hz	2.00		1239	
P2.4.16	Inching reference 2	-320.00	320.00	Hz	653.36		1240	
P2.4.17	Inching ramp	0.1	3200.0	s	1.0		1257	
P2.4.18	Emergency stop mode	0	1		0		1276	0 = Coasting 1 = Ramp
P2.4.19	Control options	0	65536		0		1084	
P2.4.20	Modulator type	0	1		0		1516	0 = ASIC modulator 1 = Software Modulator 1

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.4.21	Ramp; Skip S2	0	1		0		1900	

<sup>1</sup> Parameter value can only be changed after the AC drive has been stopped.

## 7.4.6 Prohibit Frequency Parameters (Control Panel: Menu M2 -> G2.5)

**Table 71: Prohibit Frequency Parameters, G2.5**

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.5.1	Prohibit frequency range 1 low limit	-1.00	320.00	Hz	0.00		509	0 = Not used
P2.5.2	Prohibit frequency range 1 high limit	0.00	320.00	Hz	0.00		510	0 = Not used
P2.5.3	Prohibit frequency range 2 low limit	0.00	320.00	Hz	0.00		511	0 = Not used
P2.5.4	Prohibit frequency range 2 high limit	0.00	320.00	Hz	0.00		512	0 = Not used
P2.5.5	Prohibit frequency range 3 low limit	0.00	320.00	Hz	0.00		513	0 = Not used
P2.5.6	Prohibit frequency range 3 high limit	0.00	320.00	Hz	0.00		514	0 = Not used
P2.5.7	Prohibit acc./dec. ramp	0.1	10.0	x	1.0		518	

## 7.4.7 Motor Control Parameters, VACON® NXS (Control Panel: Menu M2 -> G2.6)

**Table 72: Motor Control Parameters, VACON® NXS, G2.6**

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.6.1	Motor control mode	0	2		0		600	0 = Frequency control 1 = Speed control 2 = Open loop torque control
P2.6.2	U/f optimisation	0	1		0		109	0 = Not used 1 = Automatic torque boost
P2.6.3	U/f ratio selection	0	3		0		108	0 = Linear 1 = Squared 2 = Programmable 3 = Linear with flux optim.
P2.6.4	Field weakening point	8.00	320.00	Hz	50.00		602	
P2.6.5	Voltage at field weakening point	10.00	200.00	%	100.00		603	
P2.6.6	U/f curve midpoint frequency	0.00	P2.6.4	Hz	50.00		604	
P2.6.7	U/f curve midpoint voltage	0.00	100.00	%	100.00		605	
P2.6.8	Output voltage at zero frequency	0.00	40.00	%	Varies		606	

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.6.9	Switching frequency	1.0	Varies	kHz	Varies		601	
P2.6.10	Overvoltage controller	0	2		1		607	0 = Not used 1 = Used (no ramping) 2 = Used (ramping)
P2.6.11	Undervoltage controller	0	2		1		608	0 = Not used 1 = Used 2 = Used (ramping to zero)
P2.6.12	Motor control mode 2	0	4		2		521	See P2.6.1
P2.6.13	Speed controller P gain (open loop)	0	32767		3000		637	
P2.6.14	Speed controller I gain (open loop)	0	32767		300		638	
P2.6.15	Load drooping	0.00	100.00	%	0.00		620	
P2.6.16	Identification	0	1		0		631	0 = No action 1 = Identification w/o run

**Table 73: Closed Loop Parameters, VACON® NXS (Control Panel: Menu M2 ->G2.6.23)**

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.6.17.1	Magnetizing current	0.00	2 x I <sub>H</sub>	A	0.00		612	
P2.6.17.2	Speed control P	1	1000		30		613	
P2.6.17.3	Speed control I time	-3200.0	3200.0	ms	100.0		614	
P2.6.17.5	Acceleration compensation	0.00	300.00	s	0.00		626	
P2.6.17.6	Slip adjust	0	500	%	75		619	
P2.6.17.7	Magnetizing current at start	0.00	I <sub>L</sub>	A	0.00		627	
P2.6.17.8	Magnetizing time at start	0	32000	ms	0		628	
P2.6.17.9	0-speed time at start	0	32000	ms	100		615	
P2.6.17.10	0-speed time at stop	0	32000	ms	100		616	
P2.6.17.11	Start-up torque	0	3		0		621	0 = Not used 1 = Torque memory 2 = Torque reference 3 = Start-up torque fwd/rev
P2.6.17.12	Start-up torque FWD	-300.0	300.0	s	0.0		633	
P2.6.17.13	Start-up torque REV	-300.0	300.0	s	0.0		634	
P2.6.17.15	Encoder filter time	0.0	100.0	ms	0.0		618	
P2.6.17.17	Current control P gain	0.00	100.00	%	40.0		617	



**Table 74: Identification Parameters, VACON® NXS (Control Panel: Menu M2 -> G2.6.25)**

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.6.18.1	Flux 10 %	0.0	250.0	%	10.0		1355	
P2.6.18.2	Flux 20 %	0.0	250.0	%	20.0		1356	
P2.6.18.3	Flux 30 %	0.0	250.0	%	30.0		1357	
P2.6.18.4	Flux 40 %	0.0	250.0	%	40.0		1358	
P2.6.18.5	Flux 50 %	0.0	250.0	%	50.0		1359	
P2.6.18.6	Flux 60 %	0.0	250.0	%	60.0		1360	
P2.6.18.7	Flux 70 %	0.0	250.0	%	70.0		1361	
P2.6.18.8	Flux 80 %	0.0	250.0	%	80.0		1362	
P2.6.18.9	Flux 90 %	0.0	250.0	%	90.0		1363	
P2.6.18.10	Flux 100 %	0.0	250.0	%	100.0		1364	
P2.6.18.11	Flux 110 %	0.0	250.0	%	110.0		1365	
P2.6.18.12	Flux 120 %	0.0	250.0	%	120.0		1366	
P2.6.18.13	Flux 130 %	0.0	250.0	%	130.0		1367	
P2.6.18.14	Flux 140 %	0.0	250.0	%	140.0		1368	
P2.6.18.15	Flux 150 %	0.0	250.0	%	150.0		1369	
P2.6.18.16	Rs Voltage Drop	0	30000		Varies		662	
P2.6.18.17	Ir Add Zero Point Voltage	0	30000		Varies		664	
P2.6.18.18	Ir Add Generator Scale	0	30000		Varies		665	
P2.6.18.19	Ir Add Motoring Scale	0	30000		Varies		667	
P2.6.18.20	IU Offset	-32000	32000		10000		668	
P2.6.18.21	IV Offset	-32000	32000		0		669	
P2.6.18.22	IW Offset	-32000	32000		0		670	
P2.6.18.23	Speed Step	-50.0	50.0		0.0		1252	
P2.6.18.24	Torque Step	-300.0	300.0		0.0		1253	

**7.4.8 Motor Control Parameters, VACON® NXP (Control Panel: Menu M2 -> G2.6)**
**Table 75: Motor Control Parameters, G2.6**

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.6.1	Motor control mode	0	4		0		600	0 = Frequency control 1 = Speed control 2 = Open loop torque control 3 = Closed loop speed ctrl 4 = Closed loop torque control
P2.6.2	Switching Frequency	10	Varies	kHz	Varies		601	
P2.6.3	Oversvoltage controller	0	2		1		607	0 = Not used
P2.6.4	Undervoltage controller	0	2		1		608	1 = Used (no ramping) 2 = Used (ramping)
P2.6.5	Motor control mode 2	0	4		2		521	See P2.6.1
P2.6.6	Load Drooping	0.00	100.00	%	0.00		620	
P2.6.7	Identification	0	4		0		631	0 = No action 1 = Identification w/o run 2 = Identification with run 3 = Encoder ID Run (PMSM) 4 = Ident All
P2.6.8	Restart Delay	100	60000	s	Varies		1424	
P2.6.9	Load Drooping Time	0	32000	ms	0		656	
P2.6.10	Negative Frequency Limit	-327.67	P2.6.11		-327.67		1286	0 = Disabled 1 = Enabled
P2.6.11	Positive Frequency Limit	P2.6.10	327.67		327.67		1285	
P2.6.12	Generator torque limit	0.0	300.0	%	300.0		1288	
P2.6.13	Motoring torque limit	0.0	300.0	%	300.0		1287	

**Table 76: Open Loop Parameters, G2.6.14**

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.6.14.1	U/f Optimization	0	1		0		109	0 = Not used 1 = Automatic torque boost

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.6.14.2	U/f Ratio Select	0	3		0		108	0 = Linear 1 = Squared 2 = Programmable 3 = Linear with flux optim.
P2.6.14.3	Field Weakening Point	8.00	320.00	Hz	50.00		602	
P2.6.14.4	Voltage at Field Weakening Point	10.00	200.00	%	100.00		603	
P2.6.14.5	U/f curve midpoint frequency	0.00	P2.6.14.4	Hz	50.00		604	
P2.6.14.6	U/f curve midpoint voltage	0.00	100.00	%	100.00		605	
P2.6.14.7	Output voltage at zero frequency	0.00	40.00		Varies		606	
P2.6.14.8	Speed controller P gain (open loop)	0	32767		3000		637	
P2.6.14.9	Speed controller I gain (open loop)	0	32767		300		638	
P2.6.14.10	Enable I/f control	0	1		0		534	
P2.6.14.11	I/f Control limit	0.0	300.0	%	10.0		1790	
P2.6.14.12	I/f current	0.0	150.0	%	50.0		1693	

**Table 77: Closed Loop Parameters, G2.6.15**

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.6.15.1	Magnetizing current	0.00	2 x I <sub>H</sub>	A	0.00		612	
P2.6.15.2	Speed control P	1	1000		30		613	
P2.6.15.3	Speed control I time	-32000	32000	ms	100.00		614	
P2.6.15.5	Acceleration compensation	0.00	300.00	s	0.00		626	
P2.6.15.6	Slip adjust	0	500	%	75		619	
P2.6.15.7	Magnetizing current at start	0	I <sub>L</sub>	A	0.00		627	
P2.6.15.8	Magnetizing time at start	0	60000	ms	0		628	
P2.6.15.9	0-speed time at start	0	32000	ms	100		615	
P2.6.15.10	0-speed time at stop	0	32000	ms	100		616	
P2.6.15.11	Start-up torque	0	3		0		621	0 = Not used 1 = Torque memory 2 = Torque reference 3 = Start-up torque fwd/rev
P2.6.15.12	Start-up torque FWD	-300.0	300.0	s	0.0		633	
P2.6.15.13	Start-up torque REV	-300.0	300.0	s	0.0		634	
P2.6.15.15	Encoder filter time	0.0	100.0	ms	0.0		618	

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.6.15.17	Current control P gain	0.0	320.0	%	40.0		617	
P2.6.15.18	CurrentControl- Time	0.0	320.0	ms	1.5		657	
P2.6.15.19	Generator power limit	0.0	300.0	%	300.0		1290	
P2.6.15.20	Motoring power limit	0.0	300.0	%	300.0		1289	
P2.6.15.21	Negative torque limit	0.0	300.0	%	300.0		645	
P2.6.15.22	Positive torque limit	0.0	300.0	%	300.0		646	
P2.6.15.23	Flux off delay	-1	32000	s	0		1402	
P2.6.15.24	Stop state flux	0.0	150.00	%	100.00		1401	
P2.6.15.25	SPC f1 point	0.00	320.00	Hz	0.00		1301	
P2.6.15.26	SPC f0 point	0.00	320.00	Hz	0.00		1300	
P2.6.15.27	SPC Kp f0	0	1000	%	100		1299	
P2.6.15.28	SPC Kp FWP	0	1000	%	100		1298	
P2.6.15.29	SPC torque minimum	0.0	400.0	%	0.0		1296	
P2.6.15.30	SPC torque minimum Kp	0	1000	%	100		1295	
P2.6.15.31	SPC Kp TC torque	0	1000	ms	0		1297	
P2.6.15.32	Flux reference	0.0	500.0	%	100.0		1250	
P2.6.15.33	Speed error filter TC	0	1000	ms	0		1311	
P2.6.15.34	Modulation limit	0	150	%	100		655	

**Table 78: PMS Motor Control Parameters, G2.6.16**

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.6.16.1	Motor type	0	1		0		650	0 = Induction Motor 1 = PMS Motor
P2.6.16.2	PMSMShaft position	0	65535		0		649	
P2.6.16.3	Start angle ID modified	0	10		0		1691	
P2.6.16.4	Start Angle ID current	0.0	150.0	%	0.0		1756	
P2.6.16.5	Polarity pulse current	-1.0	200.0	%	-1.0		1566	
P2.6.16.6	I/f current	0.0	150.0	%	50.0		1693	
P2.6.16.7	I/f control limit	0.0	300.0	%	10.0		1790	
P2.6.16.8	FluxCurrent Kp	0	32000		500		651	
P2.6.16.9	FluxCurrent Time	0.0	100.0	ms	5.0		652	

**Table 79: Identification Parameters, G2.6.17**

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.6.17.1	Flux 10 %	0.00	250.0	%	10.0		1355	

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.6.17.2	Flux 20 %	0.00	250.0	%	20.0		1356	
P2.6.17.3	Flux 30 %	0.00	250.0	%	30.0		1357	
P2.6.17.4	Flux 40 %	0.00	250.0	%	40.0		1358	
P2.6.17.5	Flux 50 %	0.00	250.0	%	50.0		1359	
P2.6.17.6	Flux 60 %	0.00	250.0	%	60.0		1360	
P2.6.17.7	Flux 70 %	0.00	250.0	%	70.0		1361	
P2.6.17.8	Flux 80 %	0.00	250.0	%	80.0		1362	
P2.6.17.9	Flux 90 %	0.00	250.0	%	90.0		1363	
P2.6.17.10	Flux 100 %	0.00	250.0	%	100.0		1364	
P2.6.17.11	Flux 110 %	0.00	250.0	%	110.0		1365	
P2.6.17.12	Flux 120 %	0.00	250.0	%	120.0		1366	
P2.6.17.13	Flux 130 %	0.00	250.0	%	130.0		1367	
P2.6.17.14	Flux 140 %	0.00	250.0	%	140.0		1368	
P2.6.17.15	Flux 150 %	0.00	250.0	%	150.0		1369	
P2.6.17.16	Rs voltage drop	0	30000		Varies		662	
P2.6.17.17	Ir add zero point voltage	0	30000		Varies		664	
P2.6.17.18	Ir add generator scale	0	30000		Varies		665	
P2.6.17.19	Ir add motoring scale	0	30000		Varies		667	
P2.6.17.20	MotorBEM Voltage	0.00	320.00	%	90.0		674	
P2.6.17.21	Ls voltage drop	0	3000		512		673	
P2.6.17.22	Iu Offset	-32000	32000		10000		668	
P2.6.17.23	Iv Offset	-32000	32000		0		669	
P2.6.17.24	Iw Offset	-32000	32000		0		670	
P2.6.17.25	Speed step	-50.0	50.0	%	0.0		1252	
P2.6.17.26	Torque step	-100.0	100.0	%	0.0		1253	

**Table 80: Stabilators, G2.6.18**

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.6.18.1	Torque stabilator gain	0	1000		100		1412	
P2.6.18.2	Torque stabilator damping	0	1000		900		1413	
P2.6.18.3	Torque stabilator gain FWP	0	1000		50		1414	
P2.6.18.4	Torque stabilator limit ratio	0	20.00	%	3.00		1720	
P2.6.18.5	Flux circle stabilator gain	0	32767		10000		1550	
P2.6.18.6	Flux stabilator TC	0	32700		900		1551	
P2.6.18.7	Flux stabilator gain	0	32000		500		1797	

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.6.18.8	Flux stabilator coefficient	-30000	32766		64		1796	
P2.6.18.9	Voltage stabilator gain	0	100.0	%	10.0		1738	
P2.6.18.10	Voltage stabilator TC	0	1000		900		1552	
P2.6.18.11	Voltage stabilator limit	0	32000	Hz	1.50		1553	

#### 7.4.9 Protections (Control Panel: Menu M2 -> G2.7)

Table 81: Protections, VACON® NXS, G2.7

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.7.1	Response to 4 mA reference fault	0	5		0		700	0 = No response 1 = Warning 2 = Warning+Previous Freq. 3 = Wrng+Preset- Freq 2.7.2 4 = Fault, stop acc. to 2.4.7 5 = Fault, stop by coasting
P2.7.2	4 mA reference fault frequency	0.00	P2.1.2	Hz	0.00		728	
P2.7.3	Response to external fault	0	3		2		701	0 = No response
P2.7.4	Input phase supervision	0	3		3		730	1 = Warning 2 = Fault, stop acc. to 2.4.7 3 = Fault, stop by coasting
P2.7.5	Response to undervoltage fault	0	1		0		727	0 = Fault stored in history 1 = Fault not stored
P2.7.6	Output phase supervision	0	3		2		702	0 = No response
P2.7.7	Earth fault protection	0	3		2		703	1 = Warning
P2.7.8	Thermal protection of the motor	0	3		2		704	2 = Fault, stop acc. to 2.4.7 3 = Fault, stop by coasting
P2.7.9	Motor ambient temperature factor	-100.0	100.0	%	0.0		705	
P2.7.10	Motor cooling factor at zero speed	0.0	150.0	%	40.0		706	
P2.7.11	Motor thermal time constant	1	200	min	Varies		707	
P2.7.12	Motor duty cycle	0	150	%	100		708	

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.7.13	Stall protection	0	3		0		709	0 = No response 1 = Warning 2 = Fault, stop acc. to 2.4.7 3 = Fault, stop by coasting
P2.7.14	Stall current	0.00	P2.1.2	A	I <sub>H</sub>		710	
P2.7.15	Stall time limit	1.00	120.00	s	15.00		711	
P2.7.16	Stall frequency limit	1.0	P2.1.2	Hz	25.00		712	
P2.7.17	Underload protection	0	3		0		713	0 = No response 1 = Warning 2 = Fault, stop acc. to 2.4.7 3 = Fault, stop by coasting
P2.7.18	Field weakening area load	10.0	150.0	%	50.0		714	
P2.7.19	Zero frequency load	5.0	150.0	%	10.0		715	
P2.7.20	Underload protection time limit	2.00	600.00	s	20.00		716	
P2.7.21	Response to thermistor fault	0	3		2		732	0 = No response
P2.7.22	Response to fieldbus fault	0	3		2		733	1 = Warning
P2.7.23	Response to slot fault	0	3		2		734	2 = Fault, stop acc. to 2.4.7 3 = Fault, stop by coasting
P2.7.24	TBoard1 Numbers	0	5		0		739	0 = Not used 1 = Channel 1 2 = Channel 1 & 2 3 = Channel 1 & 2 & 3 4 = Channel 2 & 3 5 = Channel 3
P2.7.25	TBoard Flt. Resp	0	3		0		740	0 = No response 1 = Warning 2 = Fault, stop acc. to 2.4.7 3 = Fault, stop by coasting
P2.7.26	TBoard1 Warn.Lim	-30.0	200.0	°C	120.0		741	
P2.7.27	TBoard1 Flt.Lim	-30.0	200.0	°C	130.0		742	

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.7.37	TBoard2 Numbers	0	5		0		743	0 = Not used 1 = Channel 1 2 = Channel 1 & 2 3 = Channel 1 & 2 & 3 4 = Channel 2 & 3 5 = Channel 3
P2.7.38	TBoard2 Warn.Lim	-30.0	200.0	C°	120		745	
P2.7.39	TBoard2 Flt.Lim	-30.0	200.0	C°	130		746	

**Table 82: Protections, VACON® NXP, G2.7**

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.7.1	Response to 4 mA reference fault	0	5		0		700	0 = No response 1 = Warning 2 = Warning+Previous Freq. 3 = Wrng+Preset- Freq 2.7.2 4 = Fault, stop acc. to 2.4.7 5 = Fault, stop by coasting
P2.7.2	4 mA reference fault frequency	0.00	P2.1.2	Hz	0.00		728	
P2.7.3	Response to external fault	0	3		2		701	0 = No response 1 = Warning
P2.7.4	Input phase supervision	0	3		3		730	2 = Fault, stop acc. to 2.4.7 3 = Fault, stop by coasting
P2.7.5	Response to under-voltage fault	0	1		0		727	0 = Fault stored in history 1 = Fault not stored
P2.7.6	Output phase supervision	0	3		2		702	0 = No response 1 = Warning
P2.7.7	Earth fault protection	0	3		2		703	
P2.7.8	Thermal protection of the motor	0	3		2		704	2 = Fault, stop acc. to 2.4.7 3 = Fault, stop by coasting
P2.7.9	Motor ambient temperature factor	-100.0	100.0	%	0.0		705	



Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.7.10	Motor cooling factor at zero speed	0.0	150.0	%	40.0		706	
P2.7.11	Motor thermal time constant	1	200	min	Varies		707	
P2.7.12	Motor duty cycle	0	150	%	100		708	
P2.7.13	Stall protection	0	3		0		709	0 = No response 1 = Warning 2 = Fault, stop acc. to 2.4.7 3 = Fault, stop by coasting
P2.7.14	Stall current	0.00	P2.1.2	A	$I_H$		710	
P2.7.15	Stall time limit	1.00	120.00	s	15.00		711	
P2.7.16	Stall frequency limit	1.0	P2.1.2	Hz	25.00		712	
P2.7.17	Underload protection	0	3		0		713	0 = No response 1 = Warning 2 = Fault, stop acc. to 2.4.7 3 = Fault, stop by coasting
P2.7.18	Field weakening area load	10.0	150.0	%	50.0		714	
P2.7.19	Zero frequency load	5.0	150.0	%	10.0		715	
P2.7.20	Underload protection time limit	2.00	600.00	s	20.00		716	
P2.7.21	Response to thermistor fault	0	3		2		732	0 = No response 1 = Warning 2 = Fault, stop acc. to 2.4.7 3 = Fault, stop by coasting
P2.7.22	Response to fieldbus fault	0	4		2		733	0 = No response 1 = Warning 2 = Fault, stop acc. to 2.4.7 3 = Fault, stop by coasting 4 = Warning, set frequency reference to FB Fault Frequency (P2.7.40)
P2.7.23	Response to slot fault	0	3		2		734	See P2.7.21

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.7.24	TBoard1 Numbers	0	5		0		739	0 = Not used 1 = Channel 1 2 = Channel 1 & 2 3 = Channel 1 & 2 & 3 4 = Channel 2 & 3 5 = Channel 3
P2.7.25	TBoard Flt. Resp	0	3		0		740	0 = No response 1 = Warning 2 = Fault, stop acc. to 2.4.7 3 = Fault, stop by coasting
P2.7.26	TBoard1 Warn.Lim	-30.0	200.0	°C	120.0		741	
P2.7.27	TBoard1 Flt.Lim	-30.0	200.0	°C	130.0		742	
P2.7.28	Brake fault action	1	3		1		1316	1 = Warning 2 = Fault, stop acc. to 2.4.7 3 = Fault, stop by coasting
P2.7.29	Brake fault delay	0.00	320.00	s	0.20		1317	
P2.7.30	System bus fault	0	3		3		1082	0 = No response 1 = Warning 2 = Fault, stop acc. to 2.4.7 3 = Fault, stop by coasting
P2.7.31	System bus fault delay	0.00	10.00	s	3.00		1352	
P2.7.32	Cooling fault delay	0.00	7.00	s	2.00		751	
P2.7.33	Speed error mode	0	2		0		752	0 = No response 1 = Warning 2 = Fault, stop by coasting
P2.7.34	Speed error maximum difference	0	100	%	5		753	
P2.7.35	Speed error fault delay	0.00	100.00	s	0.50		754	
P2.7.36	Safe disable mode	0	2		1		755	1 = Warning, stop by coasting 2 = Fault, stop by coasting

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.7.37	TBoard2 Numbers	0	5		0		743	0 = Not used 1 = Channel 1 2 = Channel 1 & 2 3 = Channel 1 & 2 & 3 4 = Channel 2 & 3 5 = Channel 3
P2.7.38	TBoard2 Warn.Lim	-30.0	200.0	C°	120		745	
P2.7.39	TBoard2 Flt.Lim	-30.0	200.0	C°	130		746	
P2.7.40	FB Fault Freq	0	P2.1.2	Hz	20.00		1801	
P2.7.41	ActiveFilt.Fault	0	3		2		776	0=No response 1 = Warning 2 = Fault, stop acc. to P2.4.7 3=Fault, stop by coasting

#### 7.4.10 Autorestart Parameters (Control Panel: Menu M2 -> G2.8)

**Table 83: Autorestart Parameters, G2.8**

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.8.1	Wait time	0.10	10.00	s	0.50		717	
P2.8.2	Trial time	0.00	60.00	s	30.00		718	
P2.8.3	Start function	0	2		0		719	0 = Ramp 1 = Flying start 2 = According to P2.4.6
P2.8.4	Number of tries after undervoltage trip	0	10		0		720	
P2.8.5	Number of tries after overvoltage trip	0	10		0		721	
P2.8.6	Number of tries after overcurrent trip	0	3		0		722	
P2.8.7	Number of tries after 4mA reference trip	0	10		0		723	
P2.8.8	Number of tries after motor temperature fault trip	0	10		0		726	
P2.8.9	Number of tries after external fault trip	0	10		0		725	
P2.8.10	Number of tries after underload fault trip	0	10		0		738	

**7.4.11 Fieldbus Parameters (Control Panel: Menu M2 -> G2.9)**
**Table 84: Fieldbus Parameters, G2.9**

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.9.1	Fieldbus min scale	0.00	320.00	Hz	0.00		850	
P2.9.2	Fieldbus max scale	0.00	320.00	Hz	0.00		851	
P2.9.3	Fieldbus process data out 1 selection	0	10000		1		852	
P2.9.4	Fieldbus process data out 2 selection	0	10000		2		853	
P2.9.5	Fieldbus process data out 3 selection	0	10000		3		854	
P2.9.6	Fieldbus process data out 4 selection	0	10000		4		855	
P2.9.7	Fieldbus process data out 5 selection	0	10000		5		856	
P2.9.8	Fieldbus process data out 6 selection	0	10000		6		857	
P2.9.9	Fieldbus process data out 7 selection	0	10000		7		858	
P2.9.10	Fieldbus process data out 8 selection	0	10000		37		859	
P2.9.11 <sup>(1)</sup>	Fieldbus process data out 9 selection	0	10000		0		558	
P2.9.12 <sup>(1)</sup>	Fieldbus process data out 10 selection	0	10000		0		559	
P2.9.13 <sup>(1)</sup>	Fieldbus process data out 11 selection	0	10000		0		560	
P2.9.14 <sup>(1)</sup>	Fieldbus process data out 12 selection	0	10000		0		561	
P2.9.15 <sup>(1)</sup>	Fieldbus process data out 13 selection	0	10000		0		562	
P2.9.16 <sup>(1)</sup>	Fieldbus process data out 14 selection	0	10000		0		563	
P2.9.17 <sup>(1)</sup>	Fieldbus process data out 15 selection	0	10000		0		564	
P2.9.18 <sup>(1)</sup>	Fieldbus process data out 16 selection	0	10000		0		565	
<b>VACON® NXP drives only (In VACON® NXs, default values are not editable)</b>								
P2.9.19	Fieldbus process data in 1 selection	0	10000		1140		876	
P2.9.20	Fieldbus process data in 2 selection	0	10000		46		877	
P2.9.21	Fieldbus process data in 3 selection	0	10000		47		878	
P2.9.22	Fieldbus process data in 4 selection	0	10000		48		879	
P2.9.23	Fieldbus process data in 5 selection	0	10000		0		880	
P2.9.24	Fieldbus process data in 6 selection	0	10000		0		881	
P2.9.25	Fieldbus process data in 7 selection	0	10000		0		882	
P2.9.26	Fieldbus process data in 8 selection	0	10000		0		883	
P2.9.27 <sup>(1)</sup>	Fieldbus process data in 9 selection	0	10000		0		550	
P2.9.28 <sup>(1)</sup>	Fieldbus process data in 10 selection	0	10000		0		551	
P2.9.29 <sup>(1)</sup>	Fieldbus process data in 11 selection	0	10000		0		552	
P2.9.30 <sup>(1)</sup>	Fieldbus process data in 12 selection	0	10000		0		553	
P2.9.31 <sup>(1)</sup>	Fieldbus process data in 13 selection	0	10000		0		554	

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.9.32 <sup>(1)</sup>	Fieldbus process data in 14 selection	0	10000		0		555	
P2.9.33 <sup>(1)</sup>	Fieldbus process data in 15 selection	0	10000		0		556	
P2.9.34 <sup>(1)</sup>	Fieldbus process data in 16 selection	0	10000		0		557	
P2.9.35	Fieldbus state machine	0	1		0		896	0 = Standard 1 = ProfiDrive
P2.9.36	FB Mode SlotD	0	3		1		861	0 = Normal
P2.9.37	FB Mode SlotE	0	3		1		862	1 = Extended 2 = Fast 3 = Fast PD

<sup>1</sup> Visible only if the option board installed to AC drive supports 16 Process data items.

## 7.4.12 Torque Control Parameters (Control Panel: Menu M2 -> G2.10)

**Table 85: Torque Parameters, G2.10**

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.10.1	Torque limit	0.0	300.0	%	300.0		609	
P2.10.2	Torque limit control P-gain	0	32000		3000		610	
P2.10.3	Torque limit control I-gain	0	32000		200		611	
P2.10.4	Torque reference selection	0	8		0		641	0 = Not used 1 = AI1 2 = AI2 3 = AI3 4 = AI4 5 = AI1 joystick (-10 ...10 V) 6 = AI2 joystick (-10 ...10V) 7 = Torque reference from key-pad, R3.5 8 = Fieldbus torque ref.
P2.10.5	Torque reference max.	-300.0	300.0	%	100		642	
P2.10.6	Torque reference min.	-300.0	300.0	%	100		643	

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.10.7	Torque speed limit (OL)	0	3		1		644	0 = Max. frequency 1 = Selected frequency ref. 2 = Preset speed 7
P2.10.8	Minimum frequency for open loop torque control	0.00	P2.1.2	Hz	3.00		636	
P2.10.9	Torque controller P gain	0	32000		150		639	
P2.10.10	Torque controller I gain	0	32000		10		640	
<b>VACON® NXP drives only</b>								
P2.10.11	Torque speed limit (CL)	0	7		2		1278	0 = CL speed control 1 = Pos/neg freq limits 2 = RampOut (-/+) 3 = NegFreqLimit- RampOut 4 = RampOut-Pos- FreqLimit 5 = RampOut Window 6 = 0-RampOut 7 = RampOut Window On/Off
P2.10.12	Torque reference filtering time	0	32000	ms	0		1244	
P2.10.13	Window negative	0.00	50.00	Hz	2.00		1305	
P2.10.14	Window positive	0.00	50.00	Hz	2.00		1304	
P2.10.15	Window negative off	0.00	P2.10.13	Hz	0.00		1307	
P2.10.16	Window positive off	0.00	P2.10.14	Hz	0.00		1306	
P2.10.17	Speed control output limit	0.0	300.0	%	300.0		1382	

### 7.4.13 Master Follower Parameters, VACON® NXP (Control Panel: Menu M2 -> G2.11)

Table 86: Master Follower Parameters, G2.11

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.11.1	Master Follower mode	0	2		0		1324	0 = Single drive 1 = Master drive 2 = Follower drive

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.11.2	Follower stop function	0	2		2		1089	0 = Coasting 1 = Ramping 2 = As Master
P2.11.3	Follower speed reference select	0	18		18		1081	0 = AI1 1 = AI2 2 = AI1+AI2 3 = AI1-AI2 4 = AI2-AI1 5 = AI1xAI2 6 = AI1 Joystick 7 = AI2 Joystick 8 = Keypad 9 = Fieldbus 10 = Motor potentiometer 11 = AI1, AI2 minimum 12 = AI1, AI2 maximum 13 = Max frequency 14 = AI1/AI2 selection 15 = Encoder 1 (C. 1) 16 = Encoder 2 (C. 3) 17 = Master Reference 18 = Master Ramp Out

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.11.4	Follower torque reference select	0	9		9		1083	0 = Not used 1 = AI1 2 = AI2 3 = AI3 4 = AI4 5 = AI1 joystick 6 = AI2 joystick 7 = Torque reference from keypad, R3.5 8 = FB Torque Reference 9 = Master torque
P2.11.5	Speed share	-300.00	300.00	%	100.0		1241	
P2.11.6	Load share	0.0	500.0	%	100.0		1248	
P2.11.7	Master Follower mode 2	0	2		0		1093	0 = Single drive 1 = Master drive 2 = Follower drive
P2.11.8	Follower fault	0	2		0		1536	0 = Single drive 1 = Master drive 2 = Follower drive

#### 7.4.14 Functional Safety (Control Panel: Menu M2 -> G.12)

Table 87: Functional Safety Parameters, G2.12

Index	Parameter	Min	Max	Unit	De- fault	Cust	ID	Description
P2.12.1	Response to safe stop request	0	3		0		542	0 = No action 1 = Stop by ramping, according to P2.1.4
P2.12.2	Response to SLS request	0	3		0		543	2 = Stop by ramping, according to P2.4.4 3 = Stop by ramping, deceleration ramp according to ramp configured to the safety option board
P2.12.3	Response to SDI request	0	1		0		544	0 = No action 1 = Prohibit speed reference on unintended direction



### 7.4.15 Keypad Control (Control Panel: Menu M3)

The parameters for the selection of control place and direction on the keypad are listed in the table. See the *Keypad control* menu in the User Manual of the product.

**Table 88: Keypad Control Parameters, M3**

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P3.1	Control place	0	3		1		125	0 = PC Control 1 = I/O terminal 2 = Keypad 3 = Fieldbus
P3.2	Keypad reference	P2.1.1	P2.1.2	Hz	0.00			
P3.3	Direction (on keypad)	0	1		0		123	0 = Forward 1 = Reverse
P3.4	Stop button	0	1		1		114	0 = Limited function of Stop button 1 = Stop button always enabled
R3.5	Torque reference	-300.0	300.0	%	0.0			

### 7.4.16 System Menu (Control Panel: Menu M6)

For more information related to the general use of the AC drive, such as selecting application and language, customized parameter sets, or hardware and software, see the User Manual of the product.

### 7.4.17 Expander Boards (Control Panel: Menu M7)

The *M7* menu shows the expander and option boards attached to the control board and board-related information. For more information, see the User Manual of the product.

## 8 Pump and Fan Control Application

### 8.1 Introduction to Pump and Fan Control Application

Select the Pump and Fan Control Application in menu *M6* on page *S6.2*.

The Pump and Fan Control Application can be used to control one variable speed drive and up to four auxiliary drives. The PID controller of the AC drive controls the speed of the variable speed drive. It gives control signals to start and stop the auxiliary drives to control the total flow. In addition to the eight parameter groups provided as standard, a parameter group for multi-pump and fan control functions is available.

The application has two control places on the I/O terminal. Place A is the pump and fan control and place B is the direct frequency reference. The control place is selected with input DIN 6.

The Pump and Fan Control Application is used to control the operation of pumps and fans. It can be used, for example, to decrease the delivery pressure in booster stations when the measured input pressure falls below a specified limit.

The application utilizes external contactors for switching between the motors connected to the AC drive. The autochange feature provides the capability of changing the starting order of the auxiliary drives. Autochange between 2 drives (main drive + 1 auxiliary drive) is set as default, see [10.528 Automatic Changing Between Drives \(Pump and Fan Control Application Only\)](#).

- All inputs and outputs are freely programmable.

#### Extra functions:

- Analog input signal range selection
- Two frequency limit supervisions
- Torque limit supervision
- Reference limit supervision
- Second ramps and S-shape ramp programming
- Programmable Start/Stop and Reverse logic
- DC brake at start and stop
- Three prohibit frequency areas
- Programmable U/f curve and switching frequency
- Auto restart
- Motor thermal and stall protection: fully programmable; off, warning, fault
- Motor underload protection
- Input and output phase supervision
- Sleep function

The parameters of the Pump and Fan Control Application are explained in Chapter Parameter descriptions of this manual. The explanations are arranged according to the individual ID number of the parameter.

## 8.2 Control I/O in Pump and Fan Control Application

		OPTA1		
		Terminal	Signal	Description
Reference potentiometer, 1-10kΩ		1	+10V <sub>ref</sub>	Reference output Voltage for potentiometer, etc.
		2	AI1+	Analogue input 1 Voltage range 0–10V DC Analogue input 1 PID reference from I/O Default reference from keypad P3.4
		3	AI1-	I/O Ground Ground for reference and controls
2 wire Transmitter		4	AI2+	Analogue input 2 Current range 0–20 mA Programmable (P2.2.1.9) Analogue input 2 PID actual value 1
		5	AI2-	
		6	+24V	Control voltage output Voltage for switches, etc. max 0.1 A
		7	GND	I/O ground Ground for reference and controls
		8	DIN1	Place A: Start/Stop Programmable (G2.2.6) Start signal for control place A PID Controller.
		9	DIN2	Interlock 1 Programmable (G2.2.6) Contact closed = Interlock used Contact open = Interlock not used
		10	DIN3	Interlock 2 Programmable (G2.2.6) Contact closed = Interlock used Contact open = Interlock not used
		11	CMA	Common for DIN 1–DIN 3 Connect to GND or +24 V
		12	+24 V	Control voltage output Voltage for switches (see #6)
		13	GND	I/O ground Ground for reference and controls
		14	DIN4	Place B: Start/Stop Programmable (G2.2.6) Contact closed = Start
		15	DIN5	Jogging speed selection Programmable (G2.2.6) Contact closed = Jogging speed active
		16	DIN6	Control place A/B selection Programmable (G2.2.6) Contact open = Control place A is active Contact closed = Control place B is active
		17	CMB	Common for DIN4–DIN6 Connect to GND or +24 V
		18	AO1+	Analogue output 1 Output frequency Programmable (P2.3.3.2) **) Range 0–20 mA/R <sub>L</sub> , max. 500 Ω
		19	AO1-(GND)	
		20	DO1	Digital output READY Programmable (G2.3.1) Open collector, I ≤ 50 mA, U ≤ 48 VDC
<b>OPTA2 / OPTA3 (***)</b>				
		21	RO1	Relay output 1 Aux/Autochange 1 Programmable (G2.3.1) *)
		22	RO1	
		23	RO1	
		24	RO2	Relay output 2 Aux/Autochange 2 Programmable (G2.3.1) *)
		25	RO2	
		26	RO2	

e:30bht098.10

\* See [table 97](#).

\*\* See [table 99](#) and [table 101](#).

\*\*\* The option board A3 has no terminal for open contact on its second relay output (terminal 24 is missing).

Illustration 20: Default I/O Configuration in Pump and Fan Control Application

See jumper selections in [illustration 21](#). More information in the User Manual of the product.

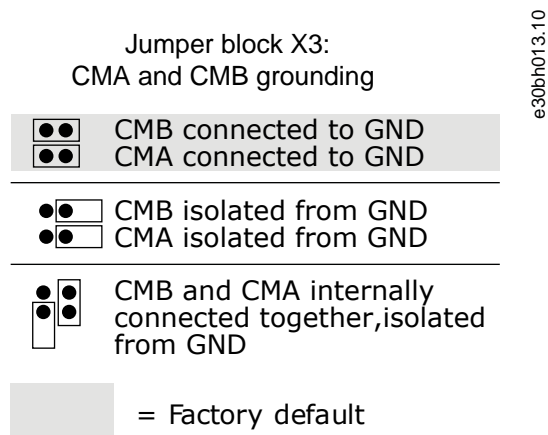


Illustration 21: Jumper Selections

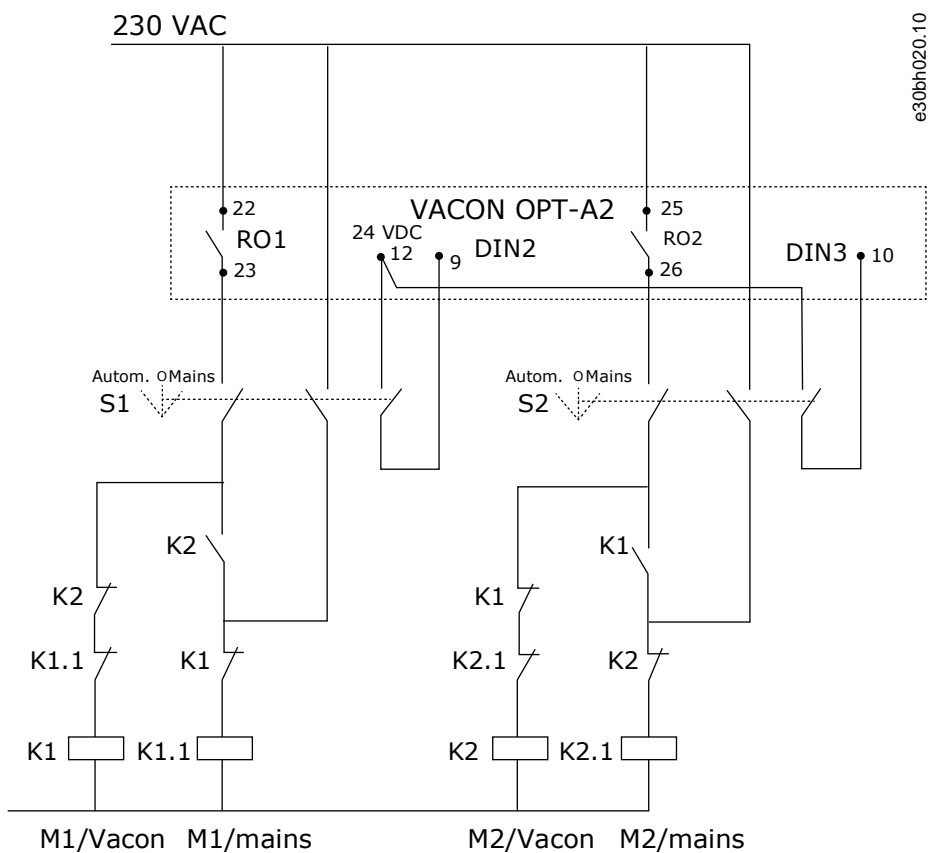


Illustration 22: Pump Autochange System, Principal Control Diagram

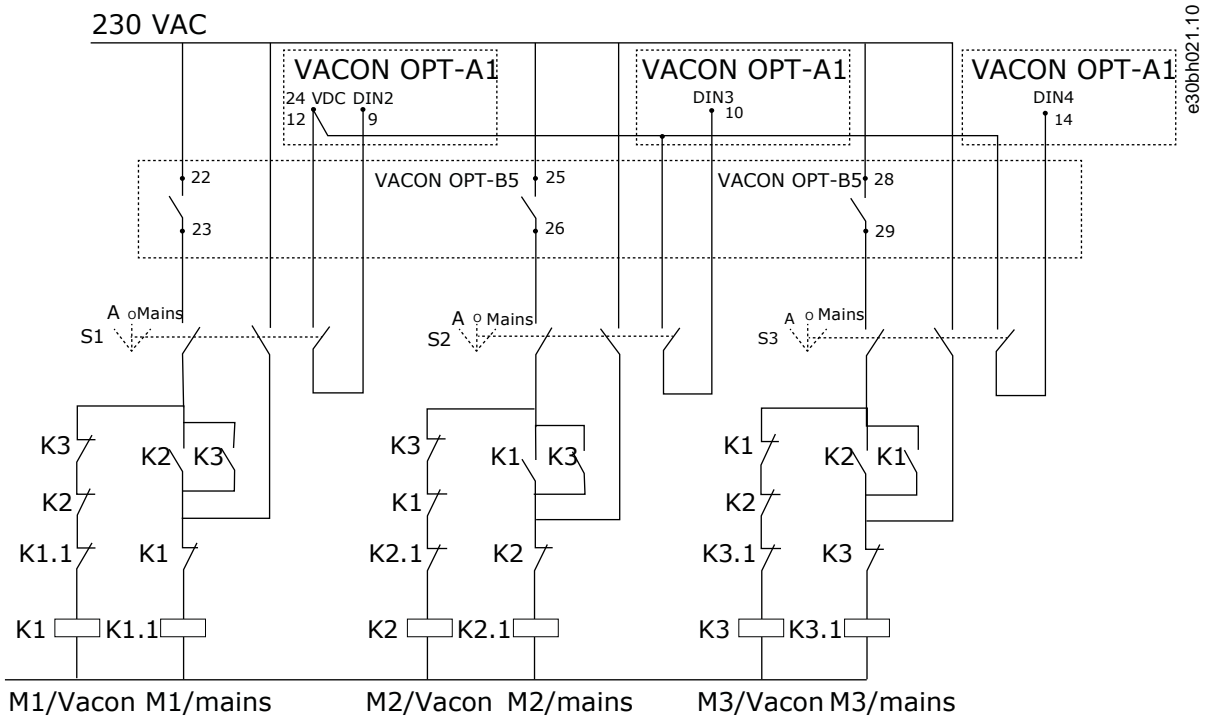


Illustration 23: Pump Autochange System, Principal Control Diagram

### 8.3 Control Signal Logic in Pump and Fan Control Application

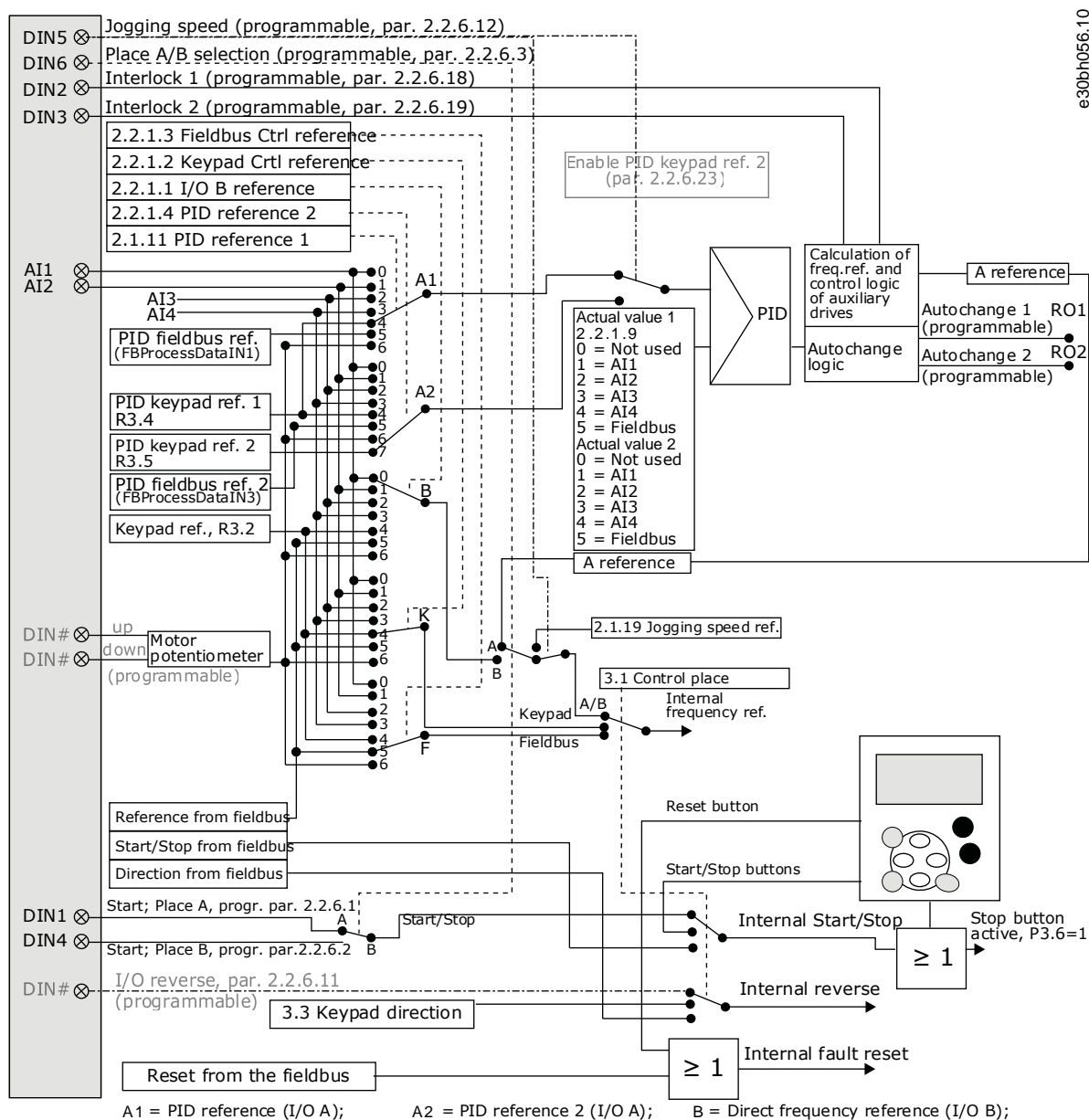


Illustration 24: Control Signal Logic of the Pump and Fan Control Application

## 8.4 Parameter Lists for Pump and Fan Control Application

### 8.4.1 Monitoring Values (Control Panel: Menu M1)

The monitoring values are the actual values of parameters and signals as well as statuses and measurements. Monitoring values cannot be edited.

**Table 89: Monitoring Values**

Index	Monitoring value	Unit	Form	ID	Description
V1.1	Output frequency	Hz	###	1	
V1.2	Frequency reference	Hz	###	25	
V1.3	Motor speed	RPM	#	2	
V1.4	Motor current	A	Varies	3	
V1.5	Motor torque	%	##	4	
V1.6	Motor shaft power	%	##	5	
V1.7	Motor voltage	V	##	6	
V1.8	DC-link voltage	V	#	7	
V1.9	Unit temperature	°C	#	8	
V1.10	Motor temperature	%	##	9	
V1.11	Analog input 1	V/mA	###	13	
V1.12	Analog input 2	V/mA	###	14	
V1.13	DIN 1, 2, 3			15	
V1.14	DIN 4, 5, 6			16	
V1.15	Analog output 1	V/mA	###	26	
V1.16	Analog input 3	V/mA	###	27	
V1.17	Analog input 4	V/mA	###	28	
V1.18	PID Reference	%		20	
V1.19	PID Actual value	%		21	
V1.20	PID Error value	%		22	
V1.21	PID Output	%		23	
V1.22	Running auxiliary drives			30	
V1.23	Special display for actual value	V		29	
V1.24	PT-100 temperature	°C	##	42	
G1.25	Multimonitoring items				
V1.26.1	Current	A	Varies	1113	
V1.26.2	Torque	%	##	1125	
V1.26.3	DC-link Voltage	V		7	
V1.26.4	Status Word			43	
V1.26.5	Fault History			37	
V1.26.6	Motor Current	A		45	

## 8.4.2 Basic Parameters (Control Panel: Menu M2 -&gt; G2.1)

Table 90: Basic Parameters G2.1

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.1.1	Min frequency	0.00	P2.1.2	Hz	0.00		101	
P2.1.2	Max frequency	P2.1.1	320.00	Hz	50.00		102	
P2.1.3	Acceleration time 1	0.1	3000.0	s	1.0		103	
P2.1.4	Deceleration time 1	0.1	3000.0	s	1.0		104	
P2.1.5	Current limit	$0.1 \times I_H$	$2 \times I_H$	A	$I_L$		107	
P2.1.6 <sup>(1)</sup>	Nominal voltage of the motor	180	690	V	NX2: 230 V NX5: 400 V NX6: 690 V		110	
P2.1.7 <sup>(1)</sup>	Nominal frequency of the motor	8.00	320.00	Hz	50.00		111	
P2.1.8 <sup>(1)</sup>	Nominal speed of the motor	24	20 000	RPM	1440		112	
P2.1.9 <sup>(1)</sup>	Nominal current of the motor	$0.1 \times I_H$	$2 \times I_H$	A	$I_H$		113	
P2.1.10 <sup>(1)</sup>	Motor cos phi	0.30	1.00		0.85		120	
P2.1.11 <sup>(1)</sup>	PID controller reference signal (Place A)	0	6		4		332	0 = AI1 1 = AI2 2 = AI3 3 = AI4 4 = PID ref from Keypad control page, P3.4 5 = PID ref. from fieldbus (FBProcessDataIN1) 6 = Motor potentiometer
P2.1.12	PID controller gain	0.0	1000.0	%	100.0		118	
P2.1.13	PID controller I-time	0.00	320.00	s	1.00		119	
P2.1.14	PID controller D-time	0.00	10.00	s	0.00		132	
P2.1.15	Sleep frequency	0	P2.1.2	Hz	10.00		1016	
P2.1.16	Sleep delay	0	3600	s	30		1017	
P2.1.17	Wake up level	0.0	1000.0	%	25.0		1018	



Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.1.18	Wake up function	0	3		0		1019	0 = Wake-up at fall below wake up level (P2.1.17)  1 = Wake-up at exceeded wake up level (P2.1.17)  2 = Wake-up at fall below wake up level (P3.4/3.5)  3 = Wake-up at exceeded wake up level (P3.4/3.5)
P2.1.19	Jogging speed reference	0.00	P2.1.2	Hz	10.00		124	

<sup>1</sup> Apply the Terminal to Function method (TTF) to these parameters (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

### 8.4.3 Input Signals

Table 91: Basic Settings (Control Panel: Menu M2 -> G2.2.1)

Index	Parameter	Min	Max	Unit	De- fault	Cust	ID	Description
P2.2.1.1 <sup>(1)</sup>	I/O B frequency reference selection	0	7		0		343	0 = AI1  1 = AI2
P2.2.1.2 <sup>(1)</sup>	Keypad control reference selection	0	7		4		121	2 = AI3  3 = AI4
P2.2.1.3 <sup>(1)</sup>	Fieldbus control reference selection	0	7		5		122	4 = Keypad reference  5 = Fieldbus reference (FB SpeedReference)  6 = Motor potentiometer  7 = PID controller

Index	Parameter	Min	Max	Unit	De- fault	Cust	ID	Description
P2.2.1.4 <sup>(1)</sup>	PID Reference 2	0	7		7		371	0 = AI1 1 = AI2 2 = AI3 3 = AI4 4 = PID reference 1 from keypad 5 = Fieldbus reference (FBProcess- Data- IN3) 6 = Motor potentiometer 7 = PID reference 2 from keypad
P2.2.1.5	PID error value inversion	0	1		0		340	0 = No inversion 1 = Inversion
P2.2.1.6	PID reference rising time	0.1	100.0	s	5.0		341	
P2.2.1.7	PID reference falling time	0.1	100.0	s	5.0		342	
P2.2.1.8 <sup>(1)</sup>	PID actual value selection	0	7		0		333	0 = Actual value 1 1 = Actual 1 + Actual 2 2 = Actual 1 - Actual 2 3 = Actual 1 * Actual 2 4 = Max (Actual 1, Actual 2) 5 = Min (Actual 1, Actual 2) 6 = Mean (Actual 1, Actual 2) 7 = Sqrt (Act1) + Sqrt (Act2) See P2.2.1.9 and P2.2.1.10
P2.2.1.9 <sup>(1)</sup>	Actual value 1 selection	0	5		2		334	0 = Not used 1 = AI1 (control board) 2 = AI2 (control board) 3 = AI3 4 = AI4 5 = Fieldbus (FBProcessDataIN2)

Index	Parameter	Min	Max	Unit	De- fault	Cust	ID	Description
P2.2.1.10 <sup>(1)</sup>	Actual value 2 input	0	5		0		335	0 = Not used 1 = AI1 (control board) 2 = AI2 (control board) 3 = AI3 4 = AI4 5 = Fieldbus (FBProcessDataIN3)
P2.2.1.11	Actual value 1 minimum scale	-1600.0	1600.0	%	0.0		336	0 = No minimum scaling
P2.2.1.12	Actual value 1 maximum scale	-1600.0	1600.0	%	100.0		337	100 = No maximum scaling
P2.2.1.13	Actual value 2 minimum scale	-1600.0	1600.0	%	0.0		338	0 = No minimum scaling
P2.2.1.14	Actual value 2 maximum scale	-1600.0	1600.0	%	100.0		339	100 = No maximum scaling
P2.2.1.15	Motor potentiometer ramp time	0.1	2000.0	Hz/s	10.0		331	
P2.2.1.16	Motor potentiometer frequency reference memory reset	0	2		1		367	0 = No reset 1 = Reset if stopped or powered down 2 = Reset if powered down
P2.2.1.17	Motor potentiometer PID reference memory reset	0	2		0		370	0 = No reset 1 = Reset if stopped or powered down 2 = Reset if powered down
P2.2.1.18	B reference scale, minimum	0.00	320.00	Hz	0.00		344	0 = Scaling off >0 = Scaled min. value
P2.2.1.19	B reference scale, maximum	0.00	320.00	Hz	0.00		345	0 = Scaling off >0 = Scaled min. value

<sup>1</sup> Apply the Terminal to Function method (TTF) to these parameters (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

Table 92: Analog Input 1 (Control Panel: Menu M2 -> G2.2.2)

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.2.2.1 <sup>(1)</sup>	AI1 signal selection	0.1	E.10		A.1		377	
P2.2.2.2	AI1 filter time	0.00	10.00	s	0.10		324	

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.2.2.3 <sup>(2)</sup>	AI1 signal range	0	2		0		320	0 = 0–10 V (0–20 mA) 1 = 2–10 V (4–20 mA) 2 = Customised
P2.2.2.4	AI1 custom minimum setting	-160.00	160.00	%	0.00		321	
P2.2.2.5	AI1 custom maximum setting	-160.00	160.00	%	100.00		322	
P2.2.2.6	AI1 signal inversion	0	1		0		323	0 = Not inverted 1 = Inverted

<sup>1</sup> Apply the Terminal to Function method (TTF) to these parameters (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#))

<sup>2</sup> Remember to place jumpers of block X2 according to the selection (0, 1 or 2). See the User Manual of the product.

**Table 93: Analog Input 2 (Control Panel: Menu M2 -> G2.2.3)**

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.2.3.1 <sup>(1)</sup>	AI2 signal selection	0.1	E.10		A.2		388	
P2.2.3.2	AI2 filter time	0.00	10.00	s	0.10		329	0 = No filtering
P2.2.3.3 <sup>(2)</sup>	AI2 signal range	0	2		1		325	0 = 0–10 V (0–20 mA) 1 = 2–10 V (4–20 mA) 2 = Customised
P2.2.3.4	AI2 custom minimum setting	-160.00	160.00	%	0.00		326	
P2.2.3.5	AI2 custom maximum setting	-160.00	160.00	%	100.00		327	
P2.2.3.6	AI2 inversion	0	1		0		328	0 = Not inverted 1 = Inverted

<sup>1</sup> Apply the Terminal to Function method (TTF) to these parameters (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#))

<sup>2</sup> Remember to place jumpers of block X2 according to the selection (0, 1, or 2). See the User Manual of the product.

**Table 94: Analog Input 3 (Control Panel: Menu M2 -> G2.2.4)**

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.2.4.1 <sup>(1)</sup>	AI3 signal selection	0.1	E.10		0.1		141	
P2.2.4.2	AI3 filter time	0.00	10.00	s	0.10		142	0 = No filtering
P2.2.4.3 <sup>(2)</sup>	AI3 signal range	0	2		1		143	0 = 0–10 V (0–20 mA) 1 = 2–10 V (4–20 mA) 2 = Customised
P2.2.4.4	AI3 custom minimum setting	-160.00	160.00	%	0.00		144	
P2.2.4.5	AI3 custom maximum setting	-160.00	160.00	%	100.00		145	

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.2.4.6	AI3 signal inversion	0	1		0		151	0 = Not inverted 1 = Inverted

<sup>1</sup> Apply the Terminal to Function method (TTF) to these parameters (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#))

<sup>2</sup> Remember to place jumpers of block X2 according to the selection (0, 1, 2 or 3). See the User Manual of the product.

**Table 95: Analog Input 4 (Control Panel: Menu M2 -> G2.2.5)**

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.2.5.1 <sup>(1)</sup>	AI4 signal selection	0.1	E.10		0.1		152	
P2.2.5.2	AI4 filter time	0.00	10.00	s	0.00		153	0 = No filtering
P2.2.5.3 <sup>(2)</sup>	AI4 signal range	0	2		1		154	0 = 0–10 V (0–20 mA) 1 = 2–10 V (4–20 mA) 2 = Customised
P2.2.5.4	AI4 custom minimum setting	-160.00	160.00	%	0.00		155	
P2.2.5.5	AI4 custom maximum setting	-160.00	160.00	%	100.00		156	
P2.2.5.6	AI4 signal inversion	0	1		0		162	0 = Not inverted 1 = Inverted

<sup>1</sup> Apply the Terminal to Function method (TTF) to these parameters (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#))

<sup>2</sup> Remember to place jumpers of block X2 according to the selection (0, 1, or 2). See the User Manual of the product.

**Table 96: Digital Inputs (Control Panel: Menu M2 -> G2.2.4)**

Index	Parameter	Min	Default	Cust	ID	Description
P2.2.6.1 <sup>(1)</sup>	Start A signal	0.1	A.1		423	
P2.2.6.2 <sup>(1)</sup>	Start B signal	0.1	A.4		424	
P2.2.6.3 <sup>(1)</sup>	Control place A/B selection	0.1	A.6		425	
P2.2.6.4 <sup>(1)</sup>	External fault (cc)	0.1	0.1		405	
P2.2.6.5 <sup>(1)</sup>	External fault (oc)	0.1	0.2		406	
P2.2.6.6 <sup>(1)</sup>	Run enable	0.1	0.2		407	
P2.2.6.7 <sup>(1)</sup>	Acc/Dec time selection	0.1	0.1		408	
P2.2.6.8 <sup>(1)</sup>	Control from I/O terminal	0.1	0.1		409	
P2.2.6.9 <sup>(1)</sup>	Control from keypad	0.1	0.1		410	
P2.2.6.10 <sup>(1)</sup>	Control from fieldbus	0.1	0.1		411	
P2.2.6.11 <sup>(1)</sup>	Reverse	0.1	0.1		412	
P2.2.6.12 <sup>(1)</sup>	Jogging speed	0.1	A.5		413	

Index	Parameter	Min	Default	Cust	ID	Description
P2.2.6.13 <sup>(1)</sup>	Fault reset	0.1	0.1		414	
P2.2.6.14 <sup>(1)</sup>	Acc/Dec prohibit	0.1	0.1		415	
P2.2.6.15 <sup>(1)</sup>	DC braking	0.1	0.1		416	
P2.2.7.16 <sup>(1)</sup>	Motor potentiometer reference DOWN	0.1	0.1		417	
P2.2.7.17 <sup>(1)</sup>	Motor potentiometer reference UP	0.1	0.1		418	
P2.2.7.18 <sup>(1)</sup>	Autochange 1 Interlock	0.1	A.2		426	
P2.2.7.19 <sup>(1)</sup>	Autochange 2 Interlock	0.1	A.3		427	
P2.2.7.20 <sup>(1)</sup>	Autochange 3 Interlock	0.1	0.1		428	
P2.2.7.21 <sup>(1)</sup>	Autochange 4 Interlock	0.1	0.1		429	
P2.2.7.22 <sup>(1)</sup>	Autochange 5 Interlock	0.1	0.1		430	
P2.2.7.23 <sup>(1)</sup>	PID reference 2	0.1	0.1		431	

<sup>1</sup> Apply the Terminal to Function method (TTF) to these parameters (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#))

cc = closing contact

oc = opening contact

## 8.4.4 Output Signals

Table 97: Digital Output Signals (Control Panel: Menu M2 -> G2.3.1)

Index	Parameter	Min	Default	Cust	ID	Description
<b>NOTICE</b>						
To avoid function overruns and to ensure flawless operation, make ABSOLUTELY sure that two functions ARE NOT CONNECTED to one and same output.						
P2.3.1.1 <sup>(1)</sup>	Ready	0.1	0.1		432	
P2.3.1.2 <sup>(1)</sup>	Run	0.1	0.1		433	
P2.3.1.3 <sup>(1)</sup>	Fault	0.1	A.1		434	
P2.3.1.4 <sup>(1)</sup>	Inverted fault	0.1	0.1		435	
P2.3.1.5 <sup>(1)</sup>	Warning	0.1	0.1		436	
P2.3.1.6 <sup>(1)</sup>	External fault	0.1	0.1		437	
P2.3.1.7 <sup>(1)</sup>	Reference fault/warning	0.1	0.1		438	
P2.3.1.8 <sup>(1)</sup>	Overtemperature warning	0.1	0.1		439	
P2.3.1.9 <sup>(1)</sup>	Reverse	0.1	0.1		440	
P2.3.1.10 <sup>(1)</sup>	Unrequested direction	0.1	0.1		441	
P2.3.1.11 <sup>(1)</sup>	At speed	0.1	0.1		442	

Index	Parameter	Min	Default	Cust	ID	Description
P2.3.1.12 <sup>(1)</sup>	Jogging speed	0.1	0.1		443	
P2.3.1.13 <sup>(1)</sup>	I/O control place	0.1	0.1		444	
P2.3.1.14 <sup>(1)</sup>	External brake control	0.1	0.1		445	See <a href="#">10.189 (ID 445) External Brake Control</a> .
P2.3.1.15 <sup>(1)</sup>	External brake control, inverted	0.1	0.1		446	
P2.3.1.16 <sup>(1)</sup>	Output frequency limit 1 supervision	0.1	0.1		447	See <a href="#">10.75 (ID 315) Output Frequency Limit Supervision Function</a>
P2.3.1.17 <sup>(1)</sup>	Output frequency limit 2 supervision	0.1	0.1		448	See <a href="#">10.104 (ID 346) Output Frequency Limit 2 Supervision Function</a> .
P2.3.1.18 <sup>(1)</sup>	Reference limit supervision	0.1	0.1		449	See <a href="#">10.108 (ID 350) Reference Limit, Supervision Function</a> .
P2.3.1.19 <sup>(1)</sup>	Temperature limit supervision	0.1	0.1		450	See <a href="#">10.112 (ID 354) Frequency Converter Temperature Limit Supervision</a> .
P2.3.1.20 <sup>(1)</sup>	Torque limit supervision	0.1	0.1		451	See <a href="#">10.106 (ID 348) Torque Limit, Supervision Function</a> .
P2.3.1.21 <sup>(1)</sup>	Thermistor fault or warning	0.1	0.1		452	
P2.3.1.22 <sup>(1)</sup>	Analog input supervision limit	0.1	0.1		463	
P2.3.1.23 <sup>(1)</sup>	Motor regulator activation	0.1	0.1		454	
P2.3.1.24 <sup>(1)</sup>	Fieldbus DIN 1	0.1	0.1		455	
P2.3.1.25 <sup>(1)</sup>	Fieldbus DIN 2	0.1	0.1		456	
P2.3.1.26 <sup>(1)</sup>	Fieldbus DIN 3	0.1	0.1		457	
P2.3.1.27 <sup>(1)</sup>	Autochange 1/Aux 1 control	0.1	B.1		458	
P2.3.1.28 <sup>(1)</sup>	Autochange 2/Aux 2 control	0.1	B.2		459	
P2.3.1.29 <sup>(1)</sup>	Autochange 3/Aux 3 control	0.1	0.1		460	
P2.3.1.30 <sup>(1)</sup>	Autochange 4/Aux 4 control	0.1	0.1		461	
P2.3.1.31 <sup>(1)</sup>	Autochange 5	0.1	0.1		461	

<sup>1</sup> Use the TTF method to program these parameters. (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#))

**Table 98: Limit Settings (Control Panel: Menu M2 -> G2.3.2)**

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.3.2.1	Output frequency limit 1 supervision	0	2		0		315	0 = No supervision 1 = Low limit supervision 2 = High limit supervision
P2.3.2.2	Output frequency limit 1; Supervised value	0.00	320.00	Hz	0.00		316	

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.3.2.3	Output frequency limit 2 supervision	0	2		0		346	0 = No limit 1 = Low limit supervision 2 = High limit supervision
P2.3.2.4	Output frequency limit 2; Supervised value	0.00	320.00	Hz	0.00		347	
P2.3.2.5	Torque limit supervision	0	2		0		348	0 = Not used 1 = Low limit supervision 2 = High limit supervision
P2.3.2.6	Torque limit supervision value	-300.0	300.0	%	100.0		349	
P2.3.2.7	Reference limit supervision	0	2		0		350	0 = No supervision 1 = Low limit 2 = High limit
P2.3.2.8	Reference limit supervision value	0.0	100.0	%	0.0		351	
P2.3.2.9	External brake-off delay	0.0	100.0	s	0.5		352	
P2.3.2.10	External brake-on delay	0.0	100.0	s	1.5		353	
P2.3.2.11	Frequency converter temperature supervision	0	2		0		354	0 = No supervision 1 = Low limit 2 = High limit
P2.3.2.12	Frequency converter temperature supervised value	-10	100	°C	40		355	
P2.3.2.13	Supervised analog input	0	1		0		372	0 = AI1 1 = AI2
P2.3.2.14	Analog input limit supervision	0	2		0		373	0 = No limit 1 = Low limit supervision 2 = High limit supervision
P2.3.2.15	Analog input supervised value	0.00	100.00	%	0.00		374	

**Table 99: Analog Output 1 (Control Panel: Menu M2 -> G2.3.3)**

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.3.3.1 <sup>(1)</sup>	Analog output 1 signal selection	0.1	E.10		A.1		464	



Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.3.3.2	Analog output function	0	14		1		307	0 = Not used (20 mA / 10 V) 1 = Output freq. (0- $f_{max}$ ) 2 = Freq. reference (0- $f_{max}$ ) 3 = Motor speed (0-Motor nominal speed) 4 = Motor current (0- $I_{nMotor}$ ) 5 = Motor torque (0- $T_{nMotor}$ ) 6 = Motor power (0- $P_{nMotor}$ ) 7 = Motor voltage (0- $U_{nMotor}$ ) 8 = DC-link volt (0-1000 V) 9 = PID controller ref. value 10 = PID contr. act.value 1 11 = PID contr. act.value 2 12 = PID contr. error value 13 = PID controller output 14 = PT100 temperature
P2.3.3.3	Analog output filter time	0.00	10.00	s	1.00		308	0 = No filtering
P2.3.3.4	Analog output inversion	0	1		0		309	0 = Not inverted 1 = Inverted
P2.3.3.5	Analog output minimum	0	1		0		310	0 = 0 mA (0 V) 1 = 4 mA (2 V)
P2.3.3.6	Analog output scale	10	1000	%	100		311	
P2.3.3.7	Analog output offset	-100.00	100.00	%	0.00		375	

<sup>1</sup> Apply the Terminal to Function method (TTF) to these parameters (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#))

Table 100: Analog Output 2 (Control Panel: Menu M2 -> G2.3.4)

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.3.6.1 <sup>(1)</sup>	Analog output 2 signal selection	0.1	E.10		0.1		471	
P2.3.6.2	Analog output 2 function	0	14		4		472	See P2.3.3.2
P2.3.6.3	Analog output 2 filter time	0.00	10.00	s	1.00		473	0 = No filtering

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.3.6.4	Analog output 2 inversion	0	1		0		474	0 = Not inverted 1 = Inverted
P2.3.6.5	Analog output 2 minimum	0	1		0		475	0 = 0 mA (0 V) 1 = 4 mA (2 V)
P2.3.6.6	Analog output 2 scale	10	1000	%	100		476	
P2.3.6.7	Analog output 2 offset	-100.00	100.00	%	0.00		477	

<sup>1</sup> Use TTF method to program these parameters, see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#).

Table 101: Analog Output 3 (Control Panel: Menu M2 -> G2.3.7)

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.3.5.1 <sup>(1)</sup>	Analog output 3 signal selection	0.1	E.10		0.1		478	
P2.3.5.2	Analog output 3 function	0	14		4		479	See P2.3.3.2
P2.3.5.3	Analog output 3 filter time	0.00	10.00	s	1.00		480	0 = No filtering
P2.3.5.4	Analog output 3 inversion	0	1		0		481	0 = Not inverted 1 = Inverted
P2.3.5.5	Analog output 3 minimum	0	1		0		482	0 = 0 mA (0 V) 1 = 4 mA (2 V)
P2.3.5.6	Analog output 3 scale	10	1000	%	100		483	
P2.3.5.7	Analog output 3 offset	-100.00	100.00	%	0.00		484	

<sup>1</sup> Use TTF method to program these parameters, see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#).

## 8.4.5 Drive Control Parameters (Control Panel: Menu M2 -> G2.4)

Table 102: Drive Control Parameters, G2.4

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.4.1	Ramp 1 shape	0.0	10.0	s	0.1		500	0 = Linear 100 = full acc/dec inc/dec times
P2.4.2	Ramp 2 shape	0.0	10.0	s	0.0		501	0 = Linear 100 = full acc/dec inc/dec times
P2.4.3	Acceleration time 2	0.1	3000.0	s	1.0		502	
P2.4.4	Deceleration time 2	0.1	3000.0	s	1.0		503	

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.4.5	Brake chopper	0	4		0		504	0 = Disabled 1 = Used when running 2 = External brake chopper 3 = Used when stopped/running 4 = Used when running (no testing)
P2.4.6	Start function	0	2		0		505	0 = Ramp 1 = Flying start 2 = Conditional flying start
P2.4.7	Stop function	0	3		0		506	0 = Coasting 1 = Ramp 2 = Ramp+Run enable coast 3 = Coast+Run enable ramp
P2.4.8	DC braking current	0.00	$I_L$	A	$0.7 \times I_H$		507	
P2.4.9	DC braking time at stop	0.00	600.00	s	0.00		508	0 = DC brake is off at stop
P2.4.10	Frequency to start DC braking during ramp stop	0.10	10.00	Hz	1.50		515	
P2.4.11	DC braking time at start	0.00	600.00	s	0.00		516	0 = DC brake is off at start
P2.4.12	Flux brake	0	1		0		520	0 = Off 1 = On
P2.4.13	Flux braking current	0.00	$I_L$	A	$I_H$		519	

## 8.4.6 Prohibit Frequency Parameters (Control Panel: Menu M2 -> G2.5)

Table 103: Prohibit Frequency Parameters, G2.5

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.5.1	Prohibit frequency range 1 low limit	-1.00	320.00	Hz	0.00		509	0 = Not used
P2.5.2	Prohibit frequency range 1 high limit	0.00	320.00	Hz	0.00		510	0 = Not used
P2.5.3	Prohibit frequency range 2 low limit	0.00	320.00	Hz	0.00		511	0 = Not used
P2.5.4	Prohibit frequency range 2 high limit	0.00	320.00	Hz	0.00		512	0 = Not used
P2.5.5	Prohibit frequency range 3 low limit	0.00	320.00	Hz	0.00		513	0 = Not used
P2.5.6	Prohibit frequency range 3 high limit	0.00	320.00	Hz	0.00		514	0 = Not used
P2.5.7	Prohibit acc./dec. ramp	0.1	10.0	x	1.0		518	

## 8.4.7 Motor Control Parameters (Control Panel: Menu M2 -&gt;G2.6)

Table 104: Motor Control Parameters, G2.6

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.6.1 <sup>(1)</sup>	Motor control mode	0	1		0		600	0 = Frequency control 1 = Speed control
P2.6.2 <sup>(1)</sup>	U/f optimisation	0	1		0		109	0 = Not used 1 = Automatic torque boost
P2.6.3 <sup>(1)</sup>	U/f ratio selection	0	3		0		108	0 = Linear 1 = Squared 2 = Programmable 3 = Linear with flux optim.
P2.6.4 <sup>(1)</sup>	Field weakening point	8.00	320.00	Hz	50.00		602	
P2.6.5 <sup>(1)</sup>	Voltage at field weakening point	10.00	200.00	%	100.00		603	
P2.6.6 <sup>(1)</sup>	U/f curve midpoint frequency	0.00	P2.6.4	Hz	50.00		604	
P2.6.7 <sup>(1)</sup>	U/f curve midpoint voltage	0.00	100.00	%	100.00		605	
P2.6.8 <sup>(1)</sup>	Output voltage at zero frequency	0.00	40.00	%	Varies		606	
P2.6.9	Switching frequency	1.0	Varies	kHz	Varies		601	For exact values, see <a href="#">table 114</a> .
P2.6.10	Overvoltage controller	0	2		1		607	0 = Not used 1 = Used (no ramping) 2 = Used (ramping)
P2.6.11	Undervoltage controller	0	2		1		608	0 = Not used 1 = Used 2 = Used (ramping to zero)
P2.6.12	Identification	0	4		0		631	0 = No action 1 = Identification w/o run 2 = Identification with run 3 = Encoder ID Run (PMSM) 4 = Ident All

<sup>1</sup> Apply the Terminal to Function (TTF) to these parameters (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

## 8.4.8 Protections (Control Panel: Menu M2 -&gt; G2.7)

Table 105: Protections, G2.7

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.7.1	Response to 4 mA reference fault	0	5		4		700	0 = No response 1 = Warning 2 = Warning+Previous Freq. 3 = Wrng+Preset- Freq 2.7.2 4 = Fault, stop acc. to 2.4.7 5 = Fault, stop by coasting
P2.7.2	4 mA reference fault frequency	0.00	P2.1.2	Hz	0.00		728	
P2.7.3	Response to external fault	0	3		2		701	0 = No response
P2.7.4	Input phase supervision	0	3		0		730	1 = Warning 2 = Fault, stop acc. to 2.4.7 3 = Fault, stop by coasting
P2.7.5	Response to undervoltage fault	0	1		0		727	0 = Fault stored in history 1 = Fault not stored
P2.7.6	Output phase supervision	0	3		2		702	0 = No response
P2.7.7	Earth fault protection	0	3		2		703	1 = Warning
P2.7.8	Thermal protection of the motor	0	3		2		704	2 = Fault, stop acc. to 2.4.7 3 = Fault, stop by coasting
P2.7.9	Motor ambient temperature factor	-100.0	100.0	%	0.0		705	
P2.7.10	Motor cooling factor at zero speed	0.0	150.0	%	40.0		706	
P2.7.11	Motor thermal time constant	1	200	min	Varies		707	
P2.7.12	Motor duty cycle	0	150	%	100		708	
P2.7.13	Stall protection	0	3		1		709	0 = No response 1 = Warning 2 = Fault, stop acc. to 2.4.7 3 = Fault, stop by coasting
P2.7.14	Stall current	0.00	2 x I <sub>H</sub>	A	I <sub>H</sub>		710	
P2.7.15	Stall time limit	1.00	120.00	s	15.00		711	
P2.7.16	Stall frequency limit	1.0	P2.1.2	Hz	25.00		712	

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.7.17	Underload protection	0	3		0		713	0 = No response 1 = Warning 2 = Fault, stop acc. to 2.4.7 3 = Fault, stop by coasting
P2.7.18	UP From Torque	10.0	150.0	%	50.0		714	
P2.7.19	UP Zero frequency load	5.0	150.0	%	10.0		715	
P2.7.20	Underload protection time limit	2.00	600.00	s	20.00		716	
P2.7.21	Response to thermistor fault	0	3		2		732	0 = No response 1 = Warning 2 = Fault, stop acc. to 2.4.7 3 = Fault, stop by coasting
P2.7.22	Response to fieldbus fault	0	3		2		733	See P2.7.21
P2.7.23	Response to slot fault	0	3		2		734	See P2.7.21
P2.7.24	No. of PT100 inputs	0	3		0		739	0 = Not used 1 = Channel 1 2 = Channel 1 & 2 3 = Channel 1 & 2 & 3
P2.7.25	Response to PT100 fault	0	3		0		740	0 = No response 1 = Warning 2 = Fault, stop acc. to 2.4.7 3 = Fault, stop by coasting
P2.7.26	PT100 warning limit	-30.0	200.0	°C	120.0		741	
P2.7.27	PT100 fault limit	-30.0	200.0	°C	130.0		742	

#### 8.4.9 Auto Restart Parameters (Control Panel: Menu M2 -> G2.8)

Table 106: Auto Restart Parameters, G2.8

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.8.1	Wait time	0.10	10.00	s	0.50		717	
P2.8.2	Trial time	0.00	60.00	s	30.00		718	

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.8.3	Start function	0	2		0		719	0 = Ramp 1 = Flying start 2 = According to P2.4.6
P2.8.4	Number of tries after undervoltage trip	0	10		1		720	
P2.8.5	Number of tries after overvoltage trip	0	10		1		721	
P2.8.6	Number of tries after overcurrent trip	0	3		1		722	
P2.8.7	Number of tries after 4mA reference trip	0	10		1		723	
P2.8.8	Number of tries after motor temperature fault trip	0	10		1		726	
P2.8.9	Number of tries after external fault trip	0	10		0		725	
P2.8.10	Number of tries after underload fault trip	0	10		1		738	

#### 8.4.10 Pump and Fan Control Parameters (Control Panel: Menu M2 -> G2.9)

Table 107: Pump and Fan Control Parameters, G2.9

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.9.1	Number of auxiliary drives	0	4		1		1001	
P2.9.2	Start frequency, auxiliary drive 1	P2.9.3	320.00	Hz	51.00		1002	
P2.9.3	Stop frequency, auxiliary drive 1	P2.1.1	P2.9.2	Hz	10.00		1003	
P2.9.4	Start frequency, auxiliary drive 2	P2.9.5	320.00	Hz	51.00		1004	
P2.9.5	Stop frequency, auxiliary drive 2	P2.1.1	P2.9.4	Hz	10.00		1005	
P2.9.6	Start frequency, auxiliary drive 3	P2.9.7	320.00	Hz	51.00		1006	
P2.9.7	Stop frequency, auxiliary drive 3	P2.1.1	P2.9.6	Hz	10.00		1007	
P2.9.8	Start frequency, auxiliary drive 4	P2.9.9	320.00	Hz	51.00		1008	
P2.9.9	Stop frequency, auxiliary drive 4	P2.1.1	P2.9.8	Hz	10.00		1009	
P2.9.10	Start delay, auxiliary drives	0.0	300.0	s	4.0		1010	
P2.9.11	Stop delay, auxiliary drives	0.0	300.0	s	2.0		1011	
P2.9.12	Reference step, auxiliary drive 1	0.00	100.00	%	0.00		1012	
P2.9.13	Reference step, auxiliary drive 2	0.00	100.00	%	0.00		1013	
P2.9.14	Reference step, auxiliary drive 3	0.00	100.00	%	0.00		1014	
P2.9.15	Reference step, auxiliary drive 4	0.00	100.00	%	0.00		1015	
P2.9.16	PID controller bypass	0	1		0		1020	1 = PID contr. bypassed

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.9.17	Analogue input selection for input pressure measurement	0	5		0		1021	0 = Not used 1 = AI1 2 = AI2 3 = AI3 4 = AI4 5 = Fieldbus signal (FBProcessDataIN3)
P2.9.18	Input pressure high limit	0.0	100.0	%	30.0		1022	
P2.9.19	Input pressure low limit	0.0	100.0	%	20.0		1023	
P2.9.20	Output pressure drop	0.0	100.0	%	30.0		1024	
P2.9.21	Frequency drop delay	0.0	300.0	s	0.0		1025	0 = No delay 300 = No frequency drop nor increase
P2.9.22	Frequency increase delay	0.0	300.0	s	0.0		1026	0 = No delay 300 = No frequency drop nor increase
P2.9.23	Interlock selection	0	2		1		1032	0 = Interlocks not used 1 = Set new interlock last; update order after value of P2.9.26 or Stop state 2 = Stop and update order immediately
P2.9.24	Autochange	0	1		1		1027	0 = Not used 1 = Autochange used
P2.9.25	Autoch. and interl. automatics selection	0	1		1		1028	0 = Auxiliary drives only 1 = All drives
P2.9.26	Autochange interval	0.0	3000.0	h	48.0		1029	0.0 = TEST=40 s
P2.9.27	Autochange; Maximum number of auxiliary drives	0	4		1		1030	
P2.9.28	Autochange frequency limit	0.00	P2.1.2	Hz	25.00		1031	
P2.9.29	Actual value special display minimum	0	30000		0		1033	
P2.9.30	Actual value special display maximum	0	30000		100		1034	
P2.9.31	Actual value special display decimals	0	4		1		1035	



Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.9.32	Actual value special display unit	0	28		4		1036	See <a href="#">10.437 (ID 1036) Actual Value Special Display Unit</a> .

### 8.4.11 Keypad Control (Control Panel: Menu M3)

The parameters for the selection of control place and direction on the keypad are listed in the table. See the *Keypad control* menu in the User Manual of the product.

Table 108: Keypad Control Parameters, M3

Index	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P3.1	Control place	1	3		1		125	1 = I/O terminal 2 = Keypad 3 = Fieldbus
P3.2	Keypad reference	P2.1.1	P2.1.2	Hz	0.00			
P3.3	Direction (on keypad)	0	1		0		123	0 = Forward 1 = Reverse
P3.4	PID reference 1	0.00	100.00	%	0.00		167	
P3.5	PID reference 2	0.00	100.00	%	0.00		168	
R3.6	Stop button	0	1		1		114	0 = Limited function of Stop button 1 = Stop button always enabled

### 8.4.12 System Menu (Control Panel: Menu M6)

For more information related to the general use of the AC drive, such as selecting application and language, customized parameter sets, or hardware and software, see the User Manual of the product.

### 8.4.13 Expander Boards (Control Panel: Menu M7)

The *M7* menu shows the expander and option boards attached to the control board and board-related information. For more information, see the User Manual of the product.

## 9 Monitoring Value Descriptions

### 9.1 (ID 1) Output Frequency

Location in the menu: **V1.1**

This monitoring value shows the actual output frequency to the motor.

### 9.2 (ID 2) Motor Speed

Location in the menu: **V1.3**

This monitoring value shows the actual speed of the motor in RPM (calculated value).

### 9.3 (ID 3) Motor Current

Location in the menu: **V1.4**

This monitoring value shows the measured current of the motor.

### 9.4 (ID 4) Motor Torque

Location in the menu: **V1.5**

This monitoring value shows the actual torque of the motor (calculated value).

When the torque is in counterclockwise direction, the value is negative.

### 9.5 (ID 5) Motor Shaft Power

Location in the menu: **V1.6**

This monitoring value shows the actual shaft power of the motor (calculated value) as a percentage of the motor nominal power.

### 9.6 (ID 6) Motor Voltage

Location in the menu: **V1.7**

This monitoring value shows the actual output voltage to the motor.

### 9.7 (ID 7) DC-Link Voltage

Location in the menu: **V1.8**

This monitoring value shows the measured voltage in the DC-link of the drive.

## 9.8 (ID 8) Unit Temperature

Location in the menu: **V1.9**

This monitoring value shows the measured heat sink temperature of the drive.

## 9.9 (ID 9) Motor Temperature

Location in the menu: **V1.10**.

This monitoring value shows the calculated motor temperature in percentage of the nominal working temperature.

## 9.10 (ID 13) Analog Input 1

Location in the menu: **V1.11**

This monitoring value shows the status of the analog input 1.

## 9.11 (ID 14) Analog Input 2

Location in the menu: **V1.12**

This monitoring value shows the status of the analog input 2.

## 9.12 (ID 15) DIN 1, DIN 2, DIN 3

Location in the menu:

- **V1.13** (Basic Application, Standard Application, Local/Remote Control Application, Multi-Step Speed Control Application, Multi-Purpose Control Application, Pump and Fan Control Application)
- **V1.15** (PID Control Application)

This monitoring value shows the status of the digital inputs 1–3 in slot A (Basic I/O).

## 9.13 (ID 16) DIN 4, DIN 5, DIN 6

Location in the menu:

- **V1.14** (Basic Application, Standard Application, Local/Remote Control Application, Multi-Step Speed Control Application, Multi-Purpose Control Application, Pump and Fan Control Application)
- **V1.16** (PID Control Application)

This monitoring value shows the status of the digital inputs 4–6 in OPTA1 (Basic I/O).

## 9.14 (ID 17) DO1, RO1, RO2

Location in the menu:

- **V1.15** (Basic Application, Standard Application, Local/Remote Control Application, Multi-Step Speed Control Application, Multi-Purpose Control Application, Pump and Fan Control Application)
- **V1.17** (PID Control Application)

This monitoring value shows the status of the digital output and relay outputs 1–2 in OPTA2 and OPTA3.

### 9.15 (ID 18) Torque Reference

Location in the menu: **V1.18** (Multi-Purpose Control Application)

This monitoring value shows the final torque reference for motor control.

### 9.16 (ID 20) PID Reference

Location in the menu:

- **V1.18** (Pump and Fan Control Application)
- **V1.19** (PID Control Application)

This monitoring value shows the PID reference as a percentage of the maximum frequency.

### 9.17 (ID 21) PID Actual Value

Location in the menu:

- **V1.19** (Pump and Fan Control Application)
- **V1.20** (PID Control Application)

This monitoring value shows the PID actual value as a percentage of the maximum actual value.

### 9.18 (ID 22) PID Error

Location in the menu:

- **V1.20** (Pump and Fan Control Application)
- **V1.21** (PID Control Application)

This monitoring value shows the error value of the PID controller.

### 9.19 (ID 23) PID Output

Location in the menu:

- **V1.21** (Pump and Fan Control Application)
- **V1.22** (PID Control Application)

This monitoring value shows the output of the PID controller as a percentage (0–100%).

## 9.20 (ID 25) Frequency Reference

Location in the menu: **V1.2**

This monitoring value shows the actual frequency reference to the motor control.

## 9.21 (ID 26) Analog Iout

Location in the menu:

- **V1.15** (Multi-Purpose Control Application, Pump and Fan Control Application)
- **V1.16** (Basic Application, Standard Application, Local/Remote Control Application, Multi-Step Speed Control Application)
- **V1.18** (PID Control Application)

This monitoring value shows the status of the analog output 1.

## 9.22 (ID 27) Analog Input 3

Location in the menu:

- **V1.13** (PID Control Application)
- **V1.16** (Multi-Purpose Control Application, Pump and Fan Control Application)

This monitoring value shows the status of the analog input 3.

## 9.23 (ID 28) Analog Input 4

Location in the menu:

- **V1.14** (PID Control Application)
- **V1.17** (Multi-Purpose Control Application, Pump and Fan Control Application)

This monitoring value shows the status of the analog input 4.

## 9.24 (ID 29) Actual Special Display

Location in the menu: **V1.23** (PID Control Application, Pump and Fan Control Application)

This monitoring value shows the actual values of parameters for special display.

## 9.25 (ID 30) Running Auxiliary Drives

Location in the menu: **V1.22** (Pump and Fan Control Application)

This monitoring value shows the actual number of auxiliary drives that operate in the system.

## 9.26 (ID 37) Fault History

Location in the menu:

- V1.22.8 (Multi-Purpose Control Application)
- V1.26.5 (Pump and Fan Control Application)

This monitoring value shows the fault code of latest activated fault that is not reset.

## 9.27 (ID 42) Sensor Max Temperature

Location in the menu:

- V1.19 (Multi-Purpose Control Application)
- V1.24 (PID Control Application, Pump and Fan Control Application)

This monitoring value shows the maximum temperature of the sensor.

## 9.28 (ID 43) Drive Status Word

Location in the menu:

- V1.21.4 (Multi-Purpose Control Application)
- V1.26.4 (PID Control Application, Pump and Fan Control Application)

This monitoring value shows the bit-coded status of the drive.

## 9.29 (ID 44) DC Voltage

Location in the menu:

- V1.21.3 (Multi-Purpose Control Application)
- V1.26.3 (PID Control Application, Pump and Fan Control Application)

This monitoring value shows the unfiltered DC-voltage.

## 9.30 (ID 45) FB Current

Location in the menu:

- V1.21.6 (Multi-Purpose Control Application, VACON® NXS)
- V1.22.9 (Multi-Purpose Control Application, VACON® NXP)
- V1.26.6 (Pump and Fan Control Application)

This monitoring value shows the measured current of the motor with fixed number of decimals.

## 9.31 (ID 46) FB Limit Scaling

Location in the menu: V1.22.5 (Multi-Purpose Control Application, VACON® NXP only)

This monitoring value shows the value of the fieldbus limit scaling as a percentage.

### 9.32 (ID 47) FB Adjust Reference

Location in the menu: **V1.22.6** (Multi-Purpose Control Application, VACON® NXP only)

This monitoring value shows the value of the fieldbus adjust reference as a percentage.

### 9.33 (ID 48) FB Analog Out

Location in the menu: **V1.22.7** (Multi-Purpose Control Application, VACON® NXP only)

This monitoring value shows the status of analog output controlled by fieldbus input.

### 9.34 (ID 49) ID Run Status

Location in the menu: **V1.21.14** (Multi-Purpose Control Application, VACON® NXP only)

This monitoring value shows the status of the identification run.

### 9.35 (ID 50) Sensor 1 Temperature

Location in the menu: **V1.21.8** (Multi-Purpose Control Application)

This monitoring value shows the measured value of the sensor 1 temperature.

### 9.36 (ID 51) Sensor 2 Temperature

Location in the menu: **V1.21.9** (Multi-Purpose Control Application)

This monitoring value shows the measured value of the sensor 2 temperature.

### 9.37 (ID 52) Sensor 3 Temperature

Location in the menu: **V1.21.10** (Multi-Purpose Control Application)

This monitoring value shows the measured value of the sensor 3 temperature.

### 9.38 (ID 53) Encoder 2 Frequency

Location in the menu: **V1.21.11** (Multi-Purpose Control Application, VACON® NXP only)

This monitoring value shows the encoder 2 frequency from the OPTA7 board (input C.3).

### 9.39 (ID 54) ABS Position

Location in the menu: **V1.21.12** (Multi-Purpose Control Application, VACON® NXP only)

This monitoring value shows the ABS position when the OPTBB board is in use.

#### 9.40 (ID 55) ABS Revolution

Location in the menu: **V1.21.13** (Multi-Purpose Control Application, VACON® NXP only)

This monitoring value shows the number of ABS revolutions when the OPTBB board is in use.

#### 9.41 (ID 56) DIN Status Word 1

Location in the menu: **V1.22.10** (Multi-Purpose Control Application in VACON® NXP only)

This monitoring value shows the bit-coded status of the digital input signals.

#### 9.42 (ID 57) DIN Status Word 2

Location in the menu: **V1.22.11** (Multi-Purpose Control Application in VACON® NXP only)

This monitoring value shows the bit-coded status of the digital input signals.

#### 9.43 (ID 58) Pole Pair Number

Location in the menu: **V1.21.15** (Multi-Purpose Control Application, VACON® NXP only)

This monitoring value shows the pole pair number in use.

#### 9.44 (ID 59) Analog Input 1

Location in the menu: **V2.21.16** (Multi-Purpose Control Application)

This monitoring value shows the value of the analog input signal as a percentage of the used range.

#### 9.45 (ID 60) Analog Input 2

Location in the menu: **V2.21.17** (Multi-Purpose Control Application)

This monitoring value shows the value of the analog input signal as a percentage of the used range.

#### 9.46 (ID 61) Analog Input 3

Location in the menu: **V2.21.18** (Multi-Purpose Control Application)

This monitoring value shows the value of the analog input signal as a percentage of the used range.

#### 9.47 (ID 62) Analog Input 4

Location in the menu: **V2.21.19** (Multi-Purpose Control Application)

This monitoring value shows the value of the analog input signal as a percentage of the used range.



### 9.48 (ID 69) Sensor 4 Temperature

Location in the menu: **V1.21.25** (Multi-Purpose Control Application)

This monitoring value shows the measured value of the sensor 4 temperature.

### 9.49 (ID 70) Sensor 5 Temperature

Location in the menu: **V1.21.26** (Multi-Purpose Control Application)

This monitoring value shows the measured value of the sensor 5 temperature.

### 9.50 (ID 71) Sensor 6 Temperature

Location in the menu: **V1.21.27** (Multi-Purpose Control Application)

This monitoring value shows the measured value of the sensor 6 temperature.

### 9.51 (ID 74) Warning

Location in the menu:

- **V1.21.7** (Multi-Purpose Control Application, VACON® NXS)
- **V1.22.12** (Multi-Purpose Control Application, VACON® NXP)

This monitoring value shows the warning code of latest activated warning that is not reset.

### 9.52 (ID 83) Total Current

Location in the menu: **V1.32.2** (Multi-Purpose Control Application, VACON® NXP only)

This monitoring value shows the total current of the drives in the Master Follower system.

### 9.53 (ID 219) FB Mode Slot D

Location in the menu: **V1.22.16** (Multi-Purpose Control Application, VACON® NXP only)

This value shows the active fieldbus mode for slot D.

### 9.54 (ID 220) FB Mode SlotE

Location in the menu: **V1.22.17** (Multi-Purpose Control Application, VACON® NXP only)

This value shows the active fieldbus mode for slot E.

### 9.55 (ID 221) Fieldbus Process Data In 1

Location in the menu: **V1.22.18.1** (Multi-Purpose Control Application, VACON® NXP only)

This monitoring value shows the raw value of process data in a 32-bit signed format.

### 9.56 (ID 222) Fieldbus Process Data In 2

Location in the menu: **V1.22.18.2** (Multi-Purpose Control Application, VACON® NXP only)

This monitoring value shows the raw value of process data in a 32-bit signed format.

### 9.57 (ID 223) Fieldbus Process Data In 3

Location in the menu: **V1.22.18.3** (Multi-Purpose Control Application, VACON® NXP only)

This monitoring value shows the raw value of process data in a 32-bit signed format.

### 9.58 (ID 224) Fieldbus Process Data In 4

Location in the menu: **V1.22.18.4** (Multi-Purpose Control Application, VACON® NXP only)

This monitoring value shows the raw value of process data in a 32-bit signed format.

### 9.59 (ID 225) Fieldbus Process Data In 5

Location in the menu: **V1.22.18.5** (Multi-Purpose Control Application, VACON® NXP only)

This monitoring value shows the raw value of process data in a 32-bit signed format.

### 9.60 (ID 226) Fieldbus Process Data In 6

Location in the menu: **V1.22.18.6** (Multi-Purpose Control Application, VACON® NXP only)

This monitoring value shows the raw value of process data in a 32-bit signed format.

### 9.61 (ID 227) Fieldbus Process Data In 7

Location in the menu: **V1.22.18.7** (Multi-Purpose Control Application, VACON® NXP only)

This monitoring value shows the raw value of process data in a 32-bit signed format.

### 9.62 (ID 228) Fieldbus Process Data In 8

Location in the menu: **V1.22.18.8** (Multi-Purpose Control Application, VACON® NXP only)

This monitoring value shows the raw value of process data in a 32-bit signed format.

### 9.63 (ID 229) Fieldbus Process Data In 9

Location in the menu: **V1.22.18.9** (Multi-Purpose Control Application, VACON® NXP only)

This monitoring value shows the raw value of process data in a 32-bit signed format.

Visible only when the option board installed in the AC drive supports 16 Process data items.

### 9.64 (ID 230) Fieldbus Process Data In 10

Location in the menu: **V1.22.18.10** (Multi-Purpose Control Application, VACON® NXP only)

This monitoring value shows the raw value of process data in a 32-bit signed format.

Visible only when the option board installed in the AC drive supports 16 Process data items.

### 9.65 (ID 231) Fieldbus Process Data In 11

Location in the menu: **V1.22.18.11** (Multi-Purpose Control Application, VACON® NXP only)

This monitoring value shows the raw value of process data in a 32-bit signed format.

Visible only when the option board installed in the AC drive supports 16 Process data items.

### 9.66 (ID 232) Fieldbus Process Data In 12

Location in the menu: **V1.22.18.12** (Multi-Purpose Control Application, VACON® NXP only)

This monitoring value shows the raw value of process data in a 32-bit signed format.

Visible only when the option board installed in the AC drive supports 16 Process data items.

### 9.67 (ID 233) Fieldbus Process Data In 13

Location in the menu: **V1.22.18.13** (Multi-Purpose Control Application, VACON® NXP only)

This monitoring value shows the raw value of process data in a 32-bit signed format.

Visible only when the option board installed in the AC drive supports 16 Process data items.

### 9.68 (ID 234) Fieldbus Process Data In 14

Location in the menu: **V1.22.18.14** (Multi-Purpose Control Application, VACON® NXP only)

This monitoring value shows the raw value of process data in a 32-bit signed format.

Visible only when the option board installed in the AC drive supports 16 Process data items.

### 9.69 (ID 235) Fieldbus Process Data In 15

Location in the menu: **V1.22.18.15** (Multi-Purpose Control Application, VACON® NXP only)

This monitoring value shows the raw value of process data in a 32-bit signed format.

Visible only when the option board installed in the AC drive supports 16 Process data items.

### 9.70 (ID 236) Fieldbus Process Data In 16

Location in the menu: **V1.22.18.16** (Multi-Purpose Control Application, VACON® NXP only)

This monitoring value shows the raw value of process data in a 32-bit signed format.

Visible only when the option board installed in the AC drive supports 16 Process data items.

### 9.71 (ID 237) Fieldbus Process Data Out 1

Location in the menu: **V1.22.18.17** (Multi-Purpose Control Application, VACON® NXP only)

This monitoring value shows the raw value of process data in a 32-bit signed format.

### 9.72 (ID 238) Fieldbus Process Data Out 2

Location in the menu: **V1.22.18.18** (Multi-Purpose Control Application, VACON® NXP only)

This monitoring value shows the raw value of process data in a 32-bit signed format.

### 9.73 (ID 239) Fieldbus Process Data Out 3

Location in the menu: **V1.22.18.19** (Multi-Purpose Control Application, VACON® NXP only)

This monitoring value shows the raw value of process data in a 32-bit signed format.

### 9.74 (ID 240) Fieldbus Process Data Out 4

Location in the menu: **V1.22.18.20** (Multi-Purpose Control Application, VACON® NXP only)

This monitoring value shows the raw value of process data in a 32-bit signed format.

### 9.75 (ID 241) Fieldbus Process Data Out 5

Location in the menu: **V1.22.18.21** (Multi-Purpose Control Application, VACON® NXP only)

This monitoring value shows the raw value of process data in a 32-bit signed format.

### 9.76 (ID 242) Fieldbus Process Data Out 6

Location in the menu: **V1.22.18.22** (Multi-Purpose Control Application, VACON® NXP only)

This monitoring value shows the raw value of process data in a 32-bit signed format.

### 9.77 (ID 243) Fieldbus Process Data Out 7

Location in the menu: **V1.22.18.23** (Multi-Purpose Control Application, VACON® NXP only)

This monitoring value shows the raw value of process data in a 32-bit signed format.

### 9.78 (ID 244) Fieldbus Process Data Out 8

Location in the menu: **V1.22.18.24** (Multi-Purpose Control Application, VACON® NXP only)

This monitoring value shows the raw value of process data in a 32-bit signed format.

### 9.79 (ID 245) Fieldbus Process Data Out 9

Location in the menu: **V1.22.18.25** (Multi-Purpose Control Application, VACON® NXP only)

This monitoring value shows the raw value of process data in a 32-bit signed format.

Visible only when the option board installed in the AC drive supports 16 Process data items.

### 9.80 (ID 246) Fieldbus Process Data Out 10

Location in the menu: **V1.22.18.26** (Multi-Purpose Control Application, VACON® NXP only)

This monitoring value shows the raw value of process data in a 32-bit signed format.

Visible only when the option board installed in the AC drive supports 16 Process data items.

### 9.81 (ID 247) Fieldbus Process Data Out 11

Location in the menu: **V1.22.18.27** (Multi-Purpose Control Application, VACON® NXP only)

This monitoring value shows the raw value of process data in a 32-bit signed format.

Visible only when the option board installed in the AC drive supports 16 Process data items.

### 9.82 (ID 248) Fieldbus Process Data Out 12

Location in the menu: **V1.22.18.28** (Multi-Purpose Control Application, VACON® NXP only)

This monitoring value shows the raw value of process data in a 32-bit signed format.

Visible only when the option board installed in the AC drive supports 16 Process data items.

### 9.83 (ID 249) Fieldbus Process Data Out 13

Location in the menu: **V1.22.18.29** (Multi-Purpose Control Application, VACON® NXP only)

This monitoring value shows the raw value of process data in a 32-bit signed format.

Visible only when the option board installed in the AC drive supports 16 Process data items.

### 9.84 (ID 250) Fieldbus Process Data Out 14

Location in the menu: **V1.22.18.30** (Multi-Purpose Control Application, VACON® NXP only)

This monitoring value shows the raw value of process data in a 32-bit signed format.

Visible only when the option board installed in the AC drive supports 16 Process data items.

### 9.85 (ID 251) Fieldbus Process Data Out 15

Location in the menu: **V1.22.18.31** (Multi-Purpose Control Application, VACON® NXP only)

This monitoring value shows the raw value of process data in a 32-bit signed format.

Visible only when the option board installed in the AC drive supports 16 Process data items.

### 9.86 (ID 252) Fieldbus Process Data Out 16

Location in the menu: **V1.22.18.32** (Multi-Purpose Control Application, VACON® NXP only)

This monitoring value shows the raw value of process data in a 32-bit signed format.

Visible only when the option board installed in the AC drive supports 16 Process data items.

### 9.87 (ID 865) Fieldbus Actual Speed

Location in the menu: **V1.22.3** (Multi-Purpose Control Application in VACON® NXP only)

This monitoring value shows the actual speed of the motor that is sent to the fieldbus.

### 9.88 (ID 875) FB Speed Reference

Location in the menu: **V1.22.2** (Multi-Purpose Control Application in VACON® NXP only)

This monitoring value shows the fieldbus frequency reference as a percentage of minimum frequency to maximum frequency.

### 9.89 (ID 1113) Current

Location in the menu:

- **V1.21.1** (Multi-Purpose Control Application in VACON® NXP only)
- **V1.26.1** (PID Control Application, Pump and Fan Control Application)

This monitoring value shows the unfiltered motor current.

### 9.90 (ID 1124) Encoder 1 Frequency

Location in the menu: **V1.21.5** (Multi-Purpose Control Application in VACON® NXP only)

This monitoring value shows the input frequency of the encoder.

### 9.91 (ID 1125) Torque

Location in the menu:

- **V1.21.2** (Multi-Purpose Control Application)
- **V1.26.2** (PID Control Application, Pump and Fan Control Application)

This monitoring value shows the unfiltered motor torque.

### 9.92 (ID 1131) Final Frequency Reference

Location in the menu: **V1.21.22** (Multi-Purpose Control Application in VACON® NXP only)

This monitoring value shows the final shaft frequency reference for the speed controller.

### 9.93 (ID 1132) Step Response

Location in the menu: **V1.21.23** (Multi-Purpose Control Application in VACON® NXP only)

This monitoring value shows the response for the frequency ramp step.

### 9.94 (ID 1140) FB Torque Reference

Location in the menu: **V1.22.4** (Multi-Purpose Control Application in VACON® NXP only)

This monitoring value shows the fieldbus torque reference.

### 9.95 (ID 1160) Fieldbus Control Word

Location in the menu: **V1.22.1** (Multi-Purpose Control Application in VACON® NXP only)

This monitoring value shows the status of the fieldbus control word that the application uses in bypass mode.

Depending on the fieldbus type or profile, the data that is received from the fieldbus can be modified before it is sent to the application.

**Table 109: Fieldbus Control Word (ProfiDrive)**

Bit	Value = 0 (FALSE)	Value = 1 (TRUE)
Bit 0	OFF	ON, Reset after Fault or b1 and b2
Bit 1	Emergency stop by coast	ON, On normal operation: Keep TRUE
Bit 2	Emergency stop by ramp	ON, On normal operation: Keep TRUE
Bit 3	STOP REQUEST	RUN REQUEST
Bit 4	Force ramp to Zero	Enable Ramp
Bit 5	Freeze Ramp	Enable Ramp
Bit 6	Force Ref to Zero	Enable Ramp
Bit 7	No action	FAULT RESET (0 -> 1)
Bit 8	No action	Inching 1
Bit 9	No action	Inching 2
Bit 10	Disable PROFIBUS control	Enable PROFIBUS control
Bit 11	Fieldbus DIN 1=OFF	Fieldbus DIN 1=ON
Bit 12	Fieldbus DIN 2=OFF	Fieldbus DIN 2=ON
Bit 13	Fieldbus DIN 3=OFF	Fieldbus DIN 3=ON
Bit 14	Fieldbus DIN 4=OFF	Fieldbus DIN 4=ON
Bit 15	No Action	No Action

### 9.96 (ID 1169) Shaft Angle

Location in the menu: **V1.21.7** (Multi-Purpose Control Application in VACON® NXP only)

This monitoring value shows the shaft angle from the encoder.

### 9.97 (ID 1170) Shaft Rounds

Location in the menu: **V1.21.6** (Multi-Purpose Control Application in VACON® NXP only)

This monitoring value shows the shaft rounds from the encoder.

### 9.98 (ID 1172) Fault Word 1

Location in the menu: **V1.22.13** (Multi-Purpose Control Application in VACON® NXP only)

This monitoring value shows the bit-coded status of the Fault Word 1.



### 9.99 (ID 1173) Fault Word 2

Location in the menu: **V1.22.14** (Multi-Purpose Control Application in VACON® NXP only)

This monitoring value shows the bit-coded status of the Fault Word 2.

### 9.100 (ID 1174) Alarm Word 1

Location in the menu: **V1.22.15** (Multi-Purpose Control Application in VACON® NXP only)

This monitoring value shows the bit-coded status of the Alarm Word.

### 9.101 (ID 1508) Output Power

Location in the menu: **V1.21.24** (Multi-Purpose Control Application in VACON® NXP only)

This monitoring value shows the output power.

### 9.102 (ID 1601) SB System Status

Location in the menu: **V1.23.1** (Multi-Purpose Control Application in VACON® NXP only)

This monitoring value shows the status of the SystemBus.

### 9.103 (ID 1602) Status Word D2

Location in the menu: **V1.23.4.2** (Multi-Purpose Control Application in VACON® NXP only)

This monitoring value shows the status of the Status Word of the Follower drive.

### 9.104 (ID 1603) Status Word D3

Location in the menu: **V1.23.4.3** (Multi-Purpose Control Application in VACON® NXP only)

This monitoring value shows the status of the Status Word of the Follower drive.

### 9.105 (ID 1604) Status Word D4

Location in the menu: **V1.23.4.4** (Multi-Purpose Control Application in VACON® NXP only)

This monitoring value shows the status of the Status Word of the Follower drive.

### 9.106 (ID 1605) Motor Current D2

Location in the menu: **V1.23.3.2** (Multi-Purpose Control Application in VACON® NXP only)

This monitoring value shows the measured current of the motor.

**9.107 (ID 1606) Motor Current D3**

Location in the menu: **V1.23.3.3** (Multi-Purpose Control Application in VACON® NXP only)

This monitoring value shows the measured current of the motor.

**9.108 (ID 1607) Motor Current D4**

Location in the menu: **V1.23.3.4** (Multi-Purpose Control Application in VACON® NXP only)

This monitoring value shows the measured current of the motor.

**9.109 (ID 1615) Status Word D1**

Location in the menu: **V1.23.4.1** (Multi-Purpose Control Application in VACON® NXP only)

This monitoring value shows the status of the Status Word of the Follower drive.

**9.110 (ID 1616) Motor Current D1**

Location in the menu: **V1.23.3.1** (Multi-Purpose Control Application in VACON® NXP only)

This monitoring value shows the measured current of the motor.

## 10 Parameter Descriptions

### 10.1 (ID 101) Minimum Frequency Reference

Location in the menu:

- **P2.1** (Basic Application)
- **P2.1.1** (Standard Application, Local/Remote Control Application, Multi-Step Speed Control Application, PID Control Application, Multi-Purpose Control Application, Pump and Fan Control Application)

Use this parameter to set the minimum frequency reference.

Minimum and maximum frequencies set limits to other frequency-related parameters (for example, *Preset Speed 1 (ID 105)*, *Preset Speed 2 (ID 106)* and *4 mA Fault Preset Speed (ID 728)*).

### 10.2 (ID 102) Maximum Frequency Reference

Location in the menu:

- **P2.2** (Basic Application)
- **P2.1.2** (Standard Application, Local/Remote Control Application, Multi-Step Speed Control Application, PID Control Application, Multi-Purpose Control Application, Pump and Fan Control Application)

Use this parameter to set the maximum frequency reference.

Defines the frequency limits of the AC drive. The maximum value for these parameters is 320 Hz.

Minimum and maximum frequencies set limits to other frequency-related parameters (for example, *Preset Speed 1 (ID 105)*, *Preset Speed 2 (ID 106)* and *4 mA Fault Preset Speed (ID 728)*).

### 10.3 (ID 103) Acceleration Time 1

Location in the menu:

- **P2.3** (Basic Application)
- **P2.1.3** (Standard Application, Local/Remote Control Application, Multi-Step Speed Control Application, PID Control Application, Multi-Purpose Control Application, Pump and Fan Control Application)

Use this parameter to set the time that is necessary for the output frequency to increase from zero frequency to maximum frequency.

### 10.4 (ID 104) Deceleration Time 1

Location in the menu:

- **P2.4** (Basic Application)
- **P2.1.4** (Standard Application, Local/Remote Control Application, Multi-Step Speed Control Application, PID Control Application, Multi-Purpose Control Application, Pump and Fan Control Application)

Use this parameter to set the time that is necessary for the output frequency to decrease from maximum frequency to zero frequency.

## 10.5 (ID 105) Preset Speed 1

Location in the menu:

- **P2.18** (Basic Application)
- **P2.1.14** (Standard Application)
- **P2.1.15** (Multi-Step Speed Control Application, Multi-Purpose Control Application)

Use this parameter to set the preset frequency reference when the preset frequencies function is used. Select the preset frequencies with the digital input signals.

Parameter values are automatically limited to the maximum frequency (*ID 102*).

Note the use of TTF-programming method in the Multi-purpose Control Application. Because all digital inputs are programmable, first assign two DINs for the Preset Speed functions (parameters *ID 419* and *ID 420*).

## 10.6 (ID 106) Preset Speed 2

Location in the menu:

- **P2.19** (Basic Application)
- **P2.1.15** (Standard Application)
- **P2.1.16** (Multi-Step Speed Control Application, Multi-Purpose Control Application)

Use this parameter to set the preset frequency reference when the preset frequencies function is used. Select the preset frequencies with the digital input signals.

Parameter values are automatically limited to the maximum frequency (*ID 102*).

Note the use of TTF-programming method in the Multi-purpose Control Application. Because all digital inputs are programmable, first assign two DINs for the Preset Speed functions (parameters *ID 419* and *ID 420*).

## 10.7 (ID 107) Current Limit

Location in the menu:

- **P2.5** (Basic Application)
- **P2.1.5** (Standard Application, Local/Remote Control Application, Multi-Step Speed Control Application, PID Control Application, Multi-Purpose Control Application, Pump and Fan Control Application)

Use this parameter to set the maximum motor current from the AC drive.

The range of values for the parameter is different for each enclosure size of the drive. When the current limit is changed, the stall current limit (*ID 710*) is internally calculated to 90% of current limit.

When the current limit is active, the drive output frequency decreases.

### NOTICE

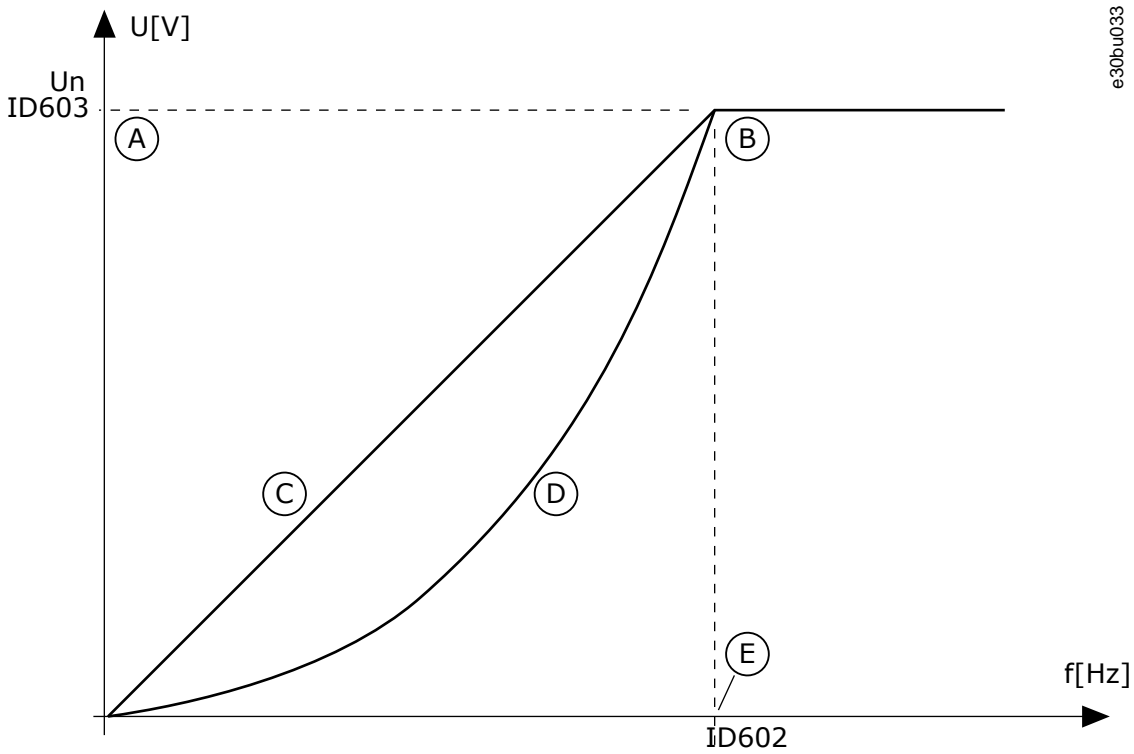
The Motor Current Limit is not an overcurrent trip limit.

## 10.8 (ID 108) U/F Ratio Selection

Location in the menu: **P2.6.3** (Standard Application, Local/Remote Control Application, Multi-Step Speed Control Application, PID Control Application, Multi-Purpose Control Application, Pump and Fan Control Application)

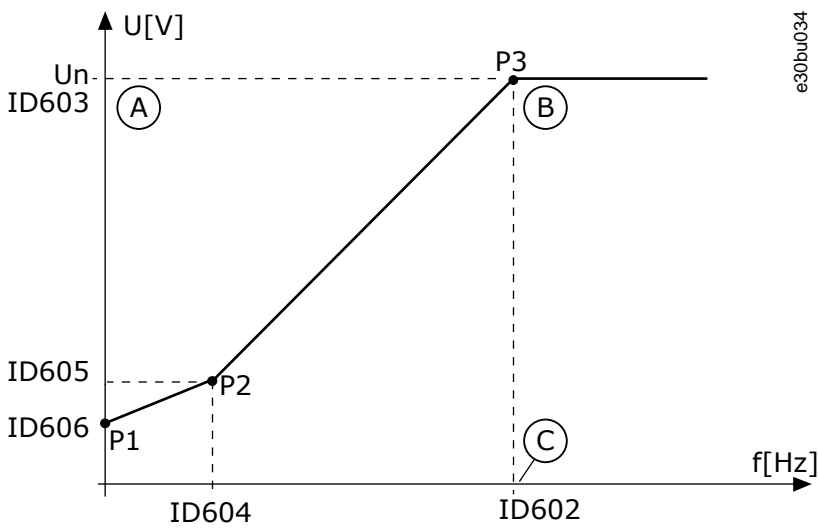
Use this parameter to set the type of the U/f curve between zero frequency and the field weakening point.

Selection number	Selection name	Description
0	Linear	The voltage of the motor changes linearly as a function of the output frequency. The voltage changes from the value of Zero Frequency Voltage (ID 606) to the value of Voltage at Field Weakening Point (ID 603) at a frequency set in Field Weakening Point Frequency (ID 602). Use this default setting if a different setting is not necessary.
1	Squared	The voltage of the motor changes from the value of Zero Frequency Voltage (ID 606) to the value of Field Weakening Point Frequency (ID 603) at a squared curve. The motor operates undermagnetized below the field weakening point and produces less torque. Use the squared U/f ratio in applications where the torque demand is in relation to the square of the speed, for example in centrifugal fans and pumps.
2	Programmable	It is possible to program the U/f curve with 3 different points: the zero frequency voltage (P1), the midpoint voltage/ frequency (P2), and the field weakening point (P3). Use the programmable U/f curve at low frequencies if it is necessary to have more torque. To find the optimal settings automatically, use the identification run (ID 631).
3	Linear with flux optimization	The AC drive starts to search for the minimum motor current to save energy and to lower the motor noise. Use it in applications such as fans and pumps.



A Default: Nominal voltage of the motor	B Field weakening point
C Linear	D Squared
E Default: Nominal frequency of the motor	

Illustration 25: Linear and squared change of the motor voltage



A Default: Nominal voltage of the motor	B Field weakening point
---	-------------------------

C Default: Nominal frequency of the motor

Illustration 26: The programmable U/f curve

### 10.9 (ID 109) U/F Optimization

Location in the menu:

- P2.13 (Basic Application)
- P2.6.2 (Standard Application, Local/Remote Control Application, Multi-Step Speed Control Application, PID Control Application, Multi-Purpose Control Application, Pump and Fan Control Application)

Use this parameter to set the U/f optimization.

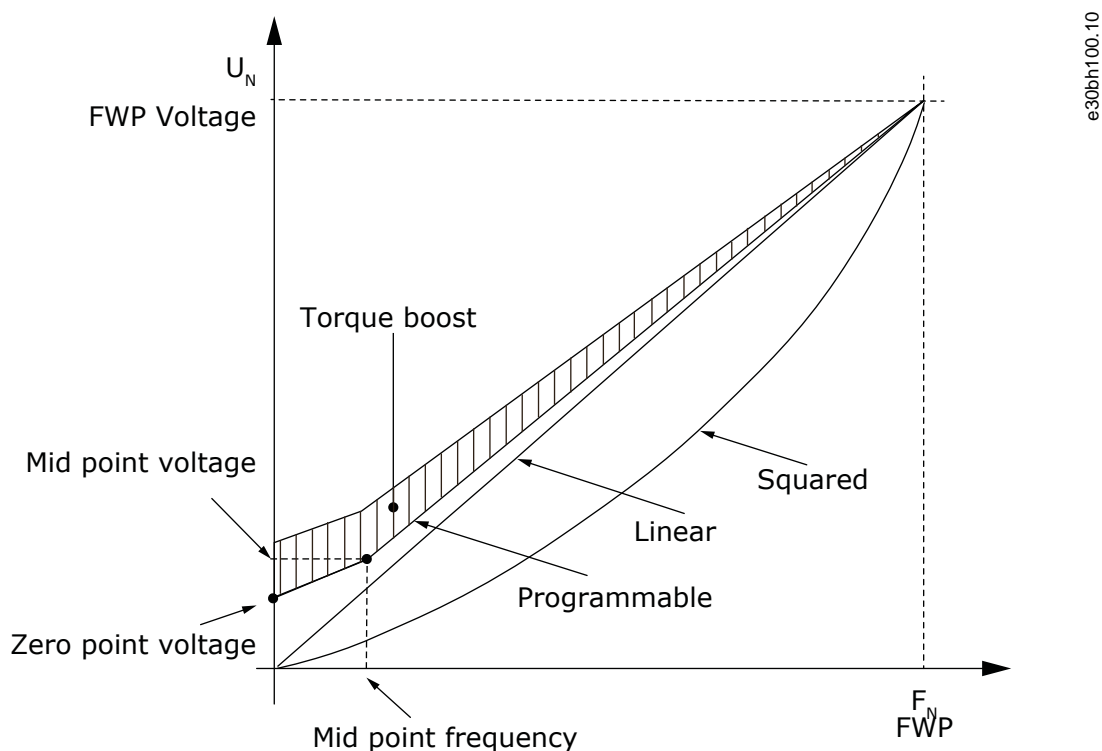


Illustration 27: U/f Optimization

The voltage to the motor changes in proportion to required torque which makes the motor produce more torque at start and when running at low frequencies. Automatic torque boost can be used in applications where starting torque due to starting friction is high, for example, in conveyors.

To start with high torque from 0 Hz, set the motor nominal values (Parameter group 2.1) either automatically (see [10.9.1 Setting the Motor Nominal Values with Automatic Functions](#)) or manually (see [10.9.2 Setting the Motor Nominal Values Manually](#)).

## NOTICE

**Motor Overheating**

In high torque – low speed applications – it is likely that the motor overheats. If the motor has to run a prolonged time under these conditions, special attention must be paid to cooling the motor.

- Use external cooling for the motor if the temperature tends to rise too high.

## 10.9.1 Setting the Motor Nominal Values with Automatic Functions

**Context:**

To start with high torque from 0 Hz, set the motor nominal values (Parameter group 2.1).

**Procedure**

1. Make identification run (ID 631) with rotating motor.
2. If needed, activate the speed control or U/f optimization (Torque boost).
3. If needed, activate both the speed control and U/f optimization.

## 10.9.2 Setting the Motor Nominal Values Manually

**Context:**

To start with high torque from 0 Hz, set the motor nominal values (Parameter group 2.1).

**Procedure**

1. Set the motor magnetizing current:
  - A Run the motor using 2/3 of motor nominal frequency as the frequency reference.
  - B Read the motor current in the *Monitoring* menu or use VACON® NCDriver for monitoring.
  - C Set this current as the motor magnetizing current (ID 612).
2. Set the U/f ration selection (ID 108) to value 2 (programmable U/f curve).
3. Run the motor with zero frequency reference and increase the motor zero-point voltage (ID 606) until the motor current is same as the motor magnetizing current.

If the motor is in a low frequency area for only short periods, it is possible to use up to 65% of the motor nominal current.

4. Set the midpoint voltage (ID 605) to  $1.4142 \cdot \text{ID } 606$  and midpoint frequency (ID 604) to value  $\text{ID } 606 / 100\% \cdot \text{ID } 111$ .
5. If needed, activate the speed control or U/f optimization (Torque boost).
6. If needed, activate both the speed control and U/f optimization.

## 10.10 (ID 110) Motor Nominal Voltage

Location in the menu:

- **P2.6** (Basic Application)
- **P2.1.6** (Standard Application, Local/Remote Control Application, Multi-Step Speed Control Application, PID Control Application, Multi-Purpose Control Application, Pump and Fan Control Application)

Find the value  $U_n$  on the nameplate of the motor. Find out whether the motor connection is Delta or Star.



This parameter sets the voltage at the field weakening point (*ID 603*) to  $100\% * U_{nMotor}$ .

### 10.11 (ID 111) Motor Nominal Frequency

Location in the menu:

- **P2.7** (Basic Application)
- **P2.1.7** (Standard Application, Local/Remote Control Application, Multi-Step Speed Control Application, PID Control Application, Multi-Purpose Control Application, Pump and Fan Control Application)

Find the value  $f_n$  on the nameplate of the motor.

This parameter sets the field weakening point (*ID 602*) to the same value.

### 10.12 (ID 112) Motor Nominal Speed

Location in the menu:

- **P2.8** (Basic Application)
- **P2.1.8** (Standard Application, Local/Remote Control Application, Multi-Step Speed Control Application, PID Control Application, Multi-Purpose Control Application, Pump and Fan Control Application)

Find the value  $n_n$  on the nameplate of the motor.

### 10.13 (ID 113) Motor Nominal Current

Location in the menu:

- **P2.9** (Basic Application)
- **P2.1.9** (Standard Application, Local/Remote Control Application, Multi-Step Speed Control Application, PID Control Application, Multi-Purpose Control Application, Pump and Fan Control Application)

Find the value  $I_n$  on the nameplate of the motor.

If magnetization current is provided, also set parameter *ID 612* before making the Identification run (VACON® NXP only).

### 10.14 (ID 114) Stop Button Activated

Location in the menu:

- **P3.4** (Basic Application, Standard Application, Local/Remote Control Application, Multi-Step Speed Control Application, PID Control Application, Multi-Purpose Control Application)
- **P3.6** (Pump and Fan Control Application)

Use this parameter to enable the stop button on the keypad.

To make the Stop button a "hotspot" which always stops the drive regardless of the selected control place, give this parameter the value 1.

See also parameter *ID 125*.

## 10.15 (ID 117) I/O Frequency Reference Selection

Location in the menu:

- **P2.14** (Basic Application)
- **P2.1.11** (Standard Application, Local/Remote Control Application, Multi-Step Speed Control Application, Multi-Purpose Control Application)

Use this parameter to select the reference source when the control place is I/O A.

Selection number	Applications:	Applications:
	Basic Application Standard Application Local/Remote Control Application Multi-Step Speed Control Application	Multi-Purpose Control Application
0	Analog input 1 (AI1)	Analog input 1 (AI1). See ID 377.
1	Analog input 2 (AI2).	Analog input 2 (AI2). See ID 388.
2	Keypad reference (Menu M3)	AI1+AI2
3	Fieldbus reference	AI1–AI2
4	Potentiometer reference (Local/Remote Control Application only)	AI2–AI1
5		AI1*AI2
6		AI1 joystick
7		AI2 joystick
8		Keypad reference (Menu M3)
9		Fieldbus reference
10		Potentiometer reference; controlled with ID 418 (TRUE=increase) and ID 417 (TRUE=decrease).
11		AI1 or AI2, whichever is lower.
12		AI1 or AI2, whichever is greater.
13		Max. frequency (recommended in torque control only)
14		AI1/AI2 selection, see ID 422.
15		Encoder 1 (AI input C.1)
16		Encoder 2 (With OPTA7 Speed Synchronization, VACON® NXP only) (AI input C.3)

## 10.16 (ID 118) PID Controller Gain

Location in the menu: **P2.1.12** (PID Control Application and Pump and Fan Control Application)

Use this parameter to adjust the gain of the PID controller.

If the value of the parameter is set to 100%, a change of 10% in the error value causes the controller output to change by 10%. If the parameter value is set to 0, the PID controller operates as ID controller.

For examples, see [10.30 \(ID 132\) PID Controller D-time](#).

## 10.17 (ID 119) PID Controller I-Time

Location in the menu: **P2.1.13** (PID Control Application and Pump and Fan Control Application)

Use this parameter to adjust the integration time of the PID controller.

If this parameter is set to 1.00 s, a change of 10% in the error value causes the controller output to change by 10.00%/s. If the parameter value is set to 0.00 s, the PID controller operates as PD controller.

For examples, see [10.30 \(ID 132\) PID Controller D-time](#).

## 10.18 (ID 120) Motor Cos Phi

Location in the menu:

- **P2.10** (Basic Application)
- **P2.1.10** (Standard Application, Local/Remote Control Application, Multi-Step Speed Control Application, PID Control Application, Multi-Purpose Control Application, Pump and Fan Control Application)

Find the value on the nameplate of the motor.

## 10.19 (ID 121) Keypad Control Reference Selection

Location in the menu:

- **P2.1.12** (Standard Application, Multi-Step Speed Control Application, Multi-Purpose Control Application)
- **P2.1.13** (Local/Remote Control Application)
- **P2.2.6** (PID Control Application)
- **P2.2.1.2** (Pump and Fan Control Application)

Use this parameter to select the reference source when the control place is keypad.

For more information on selection Fieldbus Reference, see the manual of the used fieldbus option.

## 10.20 (ID 122) Fieldbus Control Reference Selection

Location in the menu:

- **P2.1.13** (Standard Application, Multi-Step Speed Control Application, Multi-Purpose Control Application)
- **P2.1.14** (Local/Remote Control Application)
- **P2.2.7** (PID Control Application)
- **P2.2.1.3** (Pump and Fan Control Application)

Use this parameter to select the reference source when the control place is Fieldbus.

## 10.21 (ID 123) Keypad Direction

Location in the menu: **P3.3**

Use this parameter to set the rotation direction of the motor when the control place is keypad.

Selection Number	Selection Name	Description
0	Forward	The rotation of the motor is forward, when the keypad is the active control place.
1	Reverse	The rotation of the motor is reversed, when the keypad is the active control place.

For more information, see the User manual of the product.

## 10.22 (ID 124) Jogging Speed Reference

Location in the menu:

- **P2.1.14** (Multi-Step Speed Control Application, Multi-Purpose Control Application)
- **P2.1.15** (Local/Remote Control Application)
- **P2.1.19** (PID Control Application, Pump and Fan Control Application)

Use this parameter to set the jogging frequency reference when the jogging speed function is in use.

Defines the jogging speed reference when activated by digital input. See parameter *ID 301* and *ID 413*.

The parameter value is automatically limited to *Maximum frequency (ID 102)*.

## 10.23 (ID 125) Control Place

Location in the menu: **P3.1**

Use this parameter to select the control place.

For more information, see the User manual product.

Pushing the Start button for 3 s selects the control panel as the active control place and copies the Run status information (Run/Stop, direction, and reference).

## 10.24 (ID 126) Preset Speed 3

Location in the menu: **P2.1.17** (Multi-Step Speed Control Application, Multi-Purpose Control Application)

Use this parameter to set the preset speed reference when the preset speed function is used.

For more information, see [10.28 \(ID 130\) Preset Speed 7](#).

### 10.25 (ID 127) Preset Speed 4

Location in the menu: **P2.1.18** (Multi-Step Speed Control Application, Multi-Purpose Control Application)

Use this parameter to set the preset speed reference when the preset speed function is used.

For more information, see [10.28 \(ID 130\) Preset Speed 7](#).

### 10.26 (ID 128) Preset Speed 5

Location in the menu: **P2.1.19** (Multi-Step Speed Control Application, Multi-Purpose Control Application)

Use this parameter to set the preset speed reference when the preset speed function is used.

For more information, see [10.28 \(ID 130\) Preset Speed 7](#).

### 10.27 (ID 129) Preset Speed 6

Location in the menu: **P2.1.20** (Multi-Step Speed Control Application, Multi-Purpose Control Application)

Use this parameter to set the preset speed reference when the preset speed function is used.

For more information, see [10.28 \(ID 130\) Preset Speed 7](#).

### 10.28 (ID 130) Preset Speed 7

Location in the menu: **P2.1.21** (Multi-Step Speed Control Application, Multi-Purpose Control Application)

Use this parameter to set the preset speed reference when the preset speed function is used.

These parameters can be used to determine frequency references that are applied when appropriate combinations of digital inputs are activated.

In Multi-Step Speed Application (Application 4), digital inputs DIN 4, DIN 5, and DIN 6 are assigned to Preset Speed functions. The combinations of these activated inputs select the preset speed reference.

Note the use of TTF-programming method in the Multi-purpose Control Application. Because all digital inputs are programmable, first assign three DINs for the Preset Speed functions (parameters *ID 419*, *ID 420*, and *ID 421*).

Speed	DIN 4/ID 419	DIN 5/ID 420	DIN 6/ID 421
Basic speed	0	0	0
Preset speed 1 (ID 105)	1	0	0
Preset speed 2 (ID 106)	0	1	0
Preset speed 3 (ID 126)	1	1	0
Preset speed 4 (ID 127)	0	0	1
Preset speed 5 (ID 128)	1	0	1
Preset speed 6 (ID 129)	0	1	1
Preset speed 7 (ID 130)	1	1	1

See also parameters *ID 105* and *ID 106*.

Parameter value is automatically limited to *Maximum Frequency (ID 102)*.

## 10.29 (ID 131) I/O Frequency Reference Selection

Location in the menu: **P2.1.12** (Local/Remote Control Application)

Use this parameter to select the reference source when the control place is I/O B.

See the values of the parameter *ID 117*, [10.15 \(ID 117\) I/O Frequency Reference Selection](#).

## 10.30 (ID 132) PID Controller D-time

Location in the menu: **P2.1.14** (PID Control Application and Pump and Fan Control Application)

Use this parameter to adjust the derivation time of the PID controller.

If this parameter is set to 1.00 second, a change of 10% in the error value during 1.00 s causes the controller output to change by 10.00%. If the parameter value is set to 0.00 s, the PID controller operates as PI controller.

See the examples.

### Example 1

To reduce the error value to zero, with the given values, the AC drive output behaves as follows:

#### Given values:

P2.1.12, P = 0%

P2.1.13, I-time = 1.00 s

P2.1.14, D-time = 0.00 s

Minimum frequency = 0 Hz

Error value (setpoint – process value) = 10.00%

Maximum frequency = 50 Hz

In this example, the PID controller operates practically as I-controller only.

According to the given value of parameter P2.1.13 (I-time), the PID output increases by 5 Hz (10% of the difference between the maximum and minimum frequency) every second until the error value is 0.

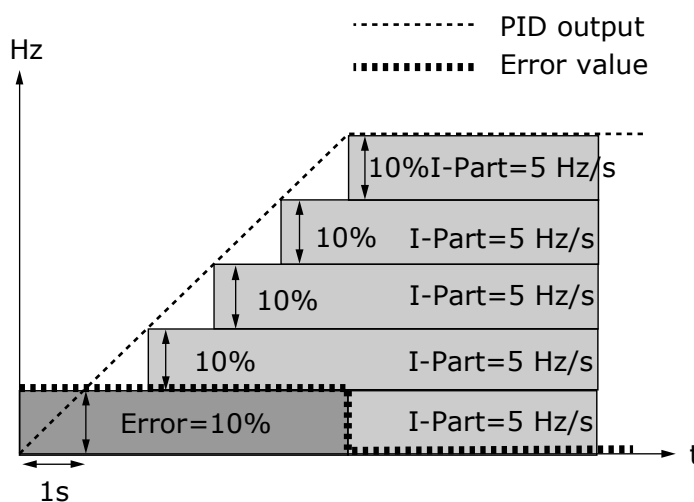


Illustration 28: PID Controller Function as I-controller

### Example 2

#### Given values:

P2.1.12, P = 100%

P2.1.13, I-time = 1.00 s

P2.1.14, D-time = 1.00 s

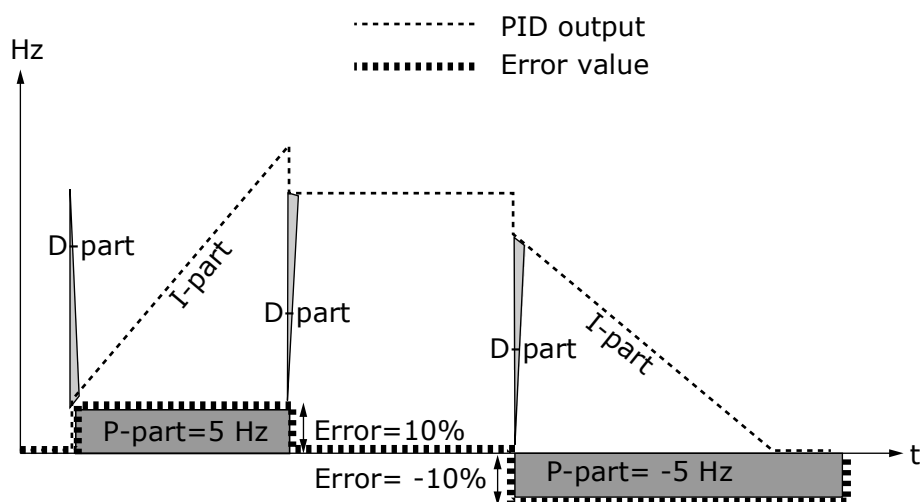
Minimum frequency = 0 Hz

Error value (setpoint – process value) = ±10%

Maximum frequency = 50 Hz

As the power is switched on, the system detects the difference between the setpoint and the actual process value and starts to either raise or decrease (in case the error value is negative) the PID output according to the I-time. Once the difference between the setpoint and the process value has been reduced to 0, the output is reduced by the amount corresponding to the value of parameter P2.1.13.

In case the error value is negative, the AC drive reacts reducing the output correspondingly.



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Illustration 29: PID Output Curve with the Values of Example 2

Example 3

Given values:

P2.1.12, P = 100%

P2.1.13, I-time = 0.00 s

P2.1.14, D-time = 1.00 s

Minimum frequency = 0 Hz

Error value (setpoint – process value) =  $\pm 10\%/s$

Maximum frequency = 50 Hz

As the error value increases, also the PID output increases according to the set values (Dtime = 1.00 s).



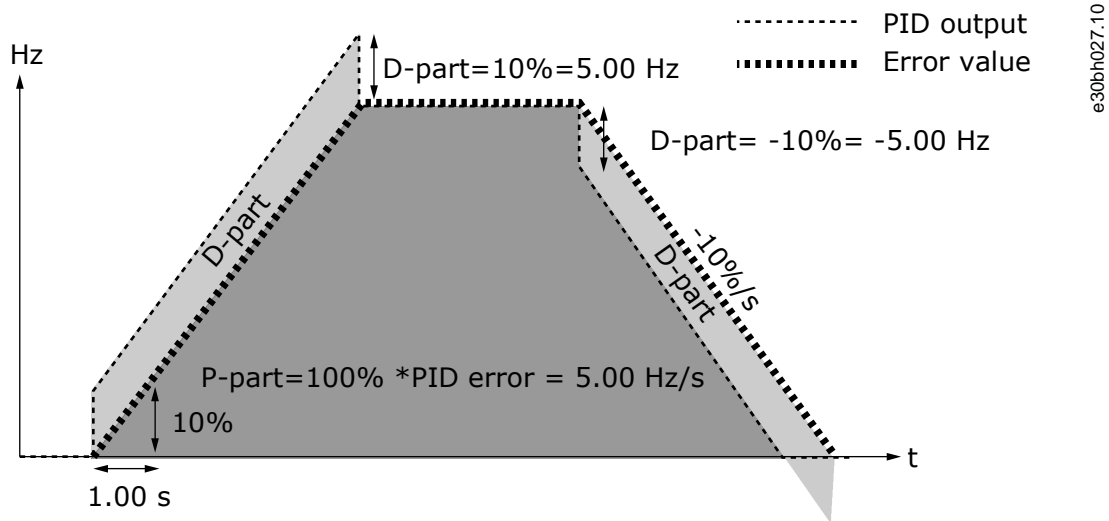


Illustration 30: PID Output with the Values of Example 3

### 10.31 (ID 133) Preset Speed 8

Location in the menu: P2.1.22 (Multi-Step Speed Control Application)

Use this parameter to set the preset speed reference when the preset speed function is used.

For more information, see [10.38 \(ID 140\) Preset Speed 15](#).

### 10.32 (ID 134) Preset Speed 9

Location in the menu: P2.1.23 (Multi-Step Speed Control Application)

Use this parameter to set the preset speed reference when the preset speed function is used.

For more information, see [10.38 \(ID 140\) Preset Speed 15](#).

### 10.33 (ID 135) Preset Speed 10

Location in the menu: P2.1.24 (Multi-Step Speed Control Application)

Use this parameter to set the preset speed reference when the preset speed function is used.

For more information, see [10.38 \(ID 140\) Preset Speed 15](#).

### 10.34 (ID 136) Preset Speed 11

Location in the menu: P2.1.25 (Multi-Step Speed Control Application)

Use this parameter to set the preset speed reference when the preset speed function is used.

For more information, see [10.38 \(ID 140\) Preset Speed 15](#).

### 10.35 (ID 137) Preset Speed 12

Location in the menu: **P2.1.26** (Multi-Step Speed Control Application) (

Use this parameter to set the preset speed reference when the preset speed function is used.

For more information, see [10.38 \(ID 140\) Preset Speed 15](#).

### 10.36 (ID 138) Preset Speed 13

Location in the menu: **P2.1.27** (Multi-Step Speed Control Application)

Use this parameter to set the preset speed reference when the preset speed function is used.

For more information, see [10.38 \(ID 140\) Preset Speed 15](#).

### 10.37 (ID 139) Preset Speed 14

Location in the menu: **P2.1.28** (Multi-Step Speed Control Application)

Use this parameter to set the preset speed reference when the preset speed function is used.

For more information, see [10.38 \(ID 140\) Preset Speed 15](#).

### 10.38 (ID 140) Preset Speed 15

Location in the menu: **P2.1.29** (Multi-Step Speed Control Application)

Use this parameter to set the preset speed reference when the preset speed function is used.

To use these preset speeds in the Multi-Step Speed Application (ASFIF04), parameter *ID 301* must be given the value 13. In Multi-Step Speed Application (Application 4), digital inputs DIN 4, DIN 5, and DIN 6 are assigned to Preset Speed functions. The combinations of these activated inputs select the preset speed reference.

Speed	Multi-step speed sel. 1 (DIN 4)	Multi-step speed sel. 2 (DIN 5)	Multi-step speed sel. 3 (DIN 6)	Multi-step speed sel. 4 (DIN 3)
P2.1.22 (8)	0	0	0	1
P2.1.23 (9)	1	0	0	1
P2.1.24 (10)	0	1	0	1
P2.1.25 (11)	1	1	0	1
P2.1.26 (12)	0	0	1	1
P2.1.27 (13)	1	0	1	1
P2.1.28 (14)	0	1	1	1
P2.1.29 (15)	1	1	1	1

### 10.39 (ID 141) AI3 Signal Selection

Location in the menu:

- **P2.2.38** (PID Control Application)
- **P2.2.4.1** (Multi-Purpose Control Application, Pump and Fan Control Application)

Use this parameter to connect the AI signal to the analog input of your selection.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

Connect the AI3 signal to the analog input of your selection with this parameter.

In VACON® NXP drive with the Multi-Purpose Control Application (Application 6), the AI3 can be controlled from fieldbus when this input is set the value 0.1.

### 10.40 (ID 142) AI3 Signal Filter Time

Location in the menu:

- **P2.2.41** (PID Control Application)
- **P2.2.4.2** (Multi-Purpose Control Application, Pump and Fan Control Application)

Use this parameter to filter out disturbances in the analog input signal.

When this parameter is given a value greater than 0.0 the function that filters out disturbances from the incoming analog signal is activated.

Long filtering time makes the regulation response slower. See parameter *ID 324*.

### 10.41 (ID 143) AI3 Signal Range

Location in the menu:

- **P2.2.39** (PID Control Application)
- **P2.2.4.3** (Multi-Purpose Control Application, Pump and Fan Control Application)

Use this parameter to change the range of the analog signal.

Use this parameter to select the AI3 signal range.

#### 10.42 (ID 144) AI3 Custom Setting Minimum

Location in the menu: **P2.2.4.4** (Multi-Purpose Control Application, Pump and Fan Control Application)

Use this parameter to adjust the scaling of the analog input signal between -160%...160% freely.

#### 10.43 (ID 145) AI3 Custom Setting Maximum

Location in the menu: **P2.2.4.5** (Multi-Purpose Control Application, Pump and Fan Control Application)

Use this parameter to adjust the scaling of the analog input signal between -160%...160% freely.

Set the custom minimum and maximum levels for the AI3 signal within -160...160%. Example: Min 40%, Max 80% = 8–16 mA.

#### 10.44 (ID 151) AI3 Signal Inversion

Location in the menu:

- **P2.2.40** (PID Control Application)
- **P2.2.4.6** (Multi-Purpose Control Application, Pump and Fan Control Application)

Use this parameter to invert the analog input signal.

#### 10.45 (ID 152) AI4 Signal Selection

Location in the menu:

- **P2.2.42** (PID Control Application)
- **P2.2.5.1** (Multi-Purpose Control Application, Pump and Fan Control Application)

Use this parameter to connect the AI signal to the analog input of your selection.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

See [10.39 \(ID 141\) AI3 Signal Selection](#).

#### 10.46 (ID 153) AI4 Filter Time

Location in the menu:

- **P2.2.45** (PID Control Application)
- **P2.2.5.2** (Multi-Purpose Control Application, Pump and Fan Control Application)

Use this parameter to filter out disturbances in the analog input signal.

See parameter [10.40 \(ID 142\) AI3 Signal Filter Time](#).

### 10.47 (ID 154) AI4 Signal Range

Location in the menu:

- **P2.2.43** (PID Control Application)
- **P2.2.5.3** (Multi-Purpose Control Application, Pump and Fan Control Application)

Use this parameter to change the range of the analog signal.

See *ID 143*.

### 10.48 (ID 155) AI4 Custom Setting Minimum

Location in the menu: **P2.2.5.4** (Multi-Purpose Control Application, Pump and Fan Control Application)

Use this parameter to adjust the scaling of the analog input signal between -160%...160% freely.

See *ID 144*.

### 10.49 (ID 156) AI4 Custom Setting Maximum

Location in the menu: **P2.2.5.5** (Multi-Purpose Control Application, Pump and Fan Control Application)

Use this parameter to adjust the scaling of the analog input signal between -160%...160% freely.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

See *ID 145*.

### 10.50 (ID 162) AI4 Signal Inversion

Location in the menu:

- **P2.2.44** (PID Control Application)
- **P2.2.5.6** (Multi-Purpose Control Application, Pump and Fan Control Application)

Use this parameter to invert the analog input signal.

See *ID 151*.

### 10.51 (ID 164) Motor Control Mode

Location in the menu: **P2.2.7.22** (Multi-Purpose Control Application)

Use this parameter to set the motor control mode 1 or 2.

Contact is open (oc) = Motor control mode 1 is selected

Contact is closed (cc) = Motor control mode 2 is selected

See parameter *ID 600* and *ID 521*.

Change from open loop to closed loop control modes and the opposite way can only be made in stop state.

### 10.52 (ID 165) AI1 Joystick Offset

Location in the menu: **P2.2.2.11** (Multi-Purpose Control Application)

Use this parameter to set the frequency zero point. Find the parameter, set the potentiometer at the assumed zero point and press [enter] on the keypad.

This action will not, however, change the reference scaling.

To change the parameter value back to 0.00%, press the [reset] button.

### 10.53 (ID 166) AI2 Joystick Offset

Location in the menu: **P2.2.3.11** (Multi-Purpose Control Application)

Use this parameter to set the frequency zero point. Find the parameter, set the potentiometer at the assumed zero point and press the [enter] button on the keypad.

See parameter *ID 165*.

### 10.54 (ID 167) PID Reference 1

Location in the menu: **P3.4** (PID Control Application, Pump and Fan Control Application)

Use this parameter to set the reference value of the PID controller.

The PID controller keypad reference can be set between 0–100%. This reference value is the active PID reference if parameter *ID 332* = 2.

### 10.55 (ID 168) PID Reference 2

Location in the menu: **P3.5** (PID Control Application, Pump and Fan Control Application)

Use this parameter to set the reference value of the PID controller.

The PID controller keypad reference 2 can be set between 0–100%. This reference is active if the DIN 5 function = 13 and the DIN 5 contact is closed.

### 10.56 (ID 169) Fieldbus DIN 4

Location in the menu: **P2.3.3.27** (Multi-Purpose Control Application)

Use this parameter to connect the Fieldbus signal (FBFixedControlWord) to the digital input of your selection.

### 10.57 (ID 170) Fieldbus DIN 5

Location in the menu: **P2.3.3.28** (Multi-Purpose Control Application)

Use this parameter to connect the Fieldbus signal (FBFixedControlWord) to the digital input of your selection.

See the fieldbus manual of the used fieldbus for more details.

### 10.58 (ID 179) Scaling of Motoring Power Limit

Location in the menu: **P2.2.6.7** (Multi-Purpose Control Application)

Use this parameter to set limit to the maximum motor power.

The motoring power limit is equal to *ID 1289* when value 0 'Not used' is selected. If any of the inputs is selected, the motoring power limit is scaled between zero and parameter *ID 1289*. This parameter is available for VACON® NXP closed loop control mode only.

### 10.59 (ID 214) Active Filter Fault Input

Location in the menu: **P2.2.7.33** (Multi-Purpose Control Application)

Use this parameter to enable Active Filter Fault.

This parameter selects the digital input which triggers active filter fault/warning according to parameter *ID 776*. If the contact is closed, the response defined by parameter *ID 776* is triggered.

This parameter is present in VACON® NXP drives only.

This input is configured as normally open. If a normally closed input is needed, consider using external fault.

### 10.60 (ID 300) Start/Stop Logic Selection

Location in the menu:

- **P2.2.1** (Standard Application, Local/Remote Control Application, Multi-Step Speed Control Application)
- **P2.2.1.1** (Multi-Purpose Control Application)

Use this parameter to control the start and stop of the drive with the digital signals.

**Table 110: Selections for Parameter ID 300**

Selection	DIN 1	DIN 2	DIN 3
0 <sup>(1)</sup>	closed contact = start forward	closed contact = start reverse	
1 <sup>(2)</sup>	closed contact = start	closed contact = reverse	
	open contact = stop	open contact = forward	

Selection	DIN 1	DIN 2	DIN 3
2	closed contact = start  open contact = stop	closed contact = start enabled  open contact = start disabled and drive stopped if running	can be programmed for reverse command
3 <sup>(3)</sup> / <sup>(4)</sup>	closed contact = start forward (Rising edge required to start) <sup>(5)</sup>	closed contact = start reverse (Rising edge required to start) <sup>(5)</sup>	
<b>Standard Application and Multi-Step Speed Control Application</b>			
4	closed contact = start forward (Rising edge required to start) <sup>(5)</sup>	closed contact = start reverse (Rising edge required to start) <sup>(5)</sup>	
5	closed contact = start (Rising edge required to start) <sup>(5)</sup>  open contact = stop	closed contact = reverse  open contact = forward	
6	closed contact = start (Rising edge required to start) <sup>(5)</sup>  open contact = stop	closed contact = start enabled  open contact = start disabled and drive stopped if running	can be programmed for reverse command unless selected for DIN 2
<b>Local/Remote Control Application and Multi-Purpose Control Application</b>			
4	closed contact = start forward	closed contact = reference increases (motor potentiometer reference; this parameter is automatically set to 4 if parameter ID 117 is set to 4 [Application 4]).	
5	closed contact = start forward (Rising edge required to start) <sup>(5)</sup>	closed contact = start reverse (Rising edge required to start) <sup>(5)</sup>	
6	closed contact = start (Rising edge required to start) <sup>(5)</sup>  open contact = stop	closed contact = start reverse (Rising edge required to start) <sup>(5)</sup>	
7	closed contact = start (Rising edge required to start) <sup>(5)</sup>  open contact = stop	closed contact = start enabled  open contact = start disabled and drive stopped if running	
<b>Local/Remote Control Application</b>			
8	closed contact = start forward (Rising edge required to start) <sup>(5)</sup>	closed contact = reference increases (motor potentiometer reference)	

<sup>1</sup> See [illustration 31](#)

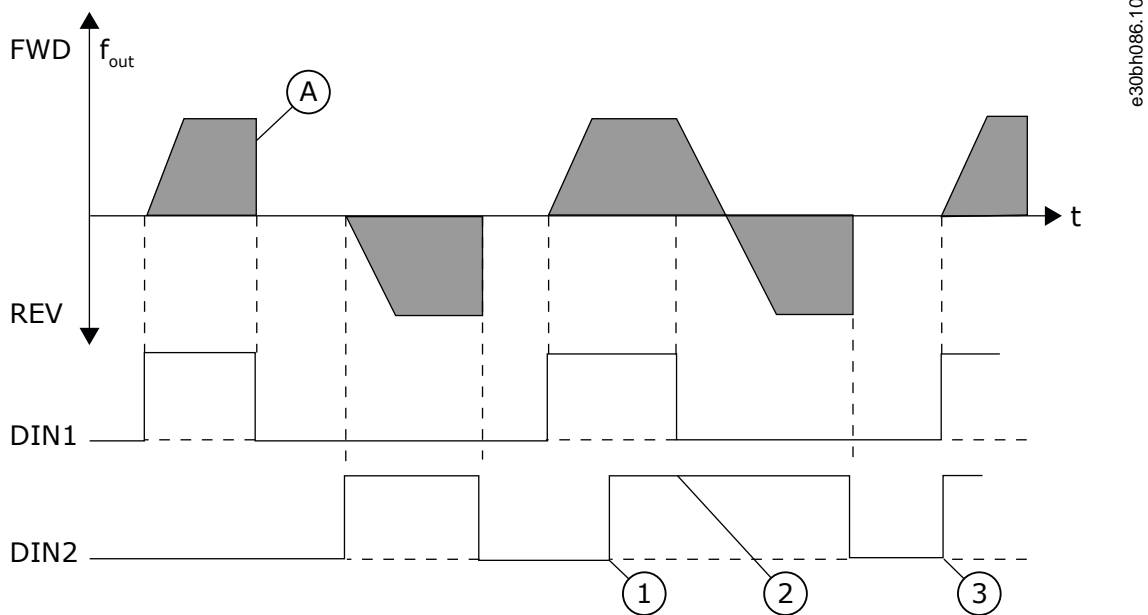
<sup>2</sup> See [illustration 32](#)

<sup>3</sup> See [illustration 33](#)

<sup>4</sup> 3-wire connection (pulse control)

<sup>5</sup> The selections including the text 'Rising edge required to start' must be used to exclude the possibility of an unintentional start when, for example, power is connected, reconnected after a power failure, after a fault reset, after the drive is stopped by Run Enable (Run Enable = False) or when the control place is changed from I/O control. The Start/Stop contact must be opened before the motor can be started.

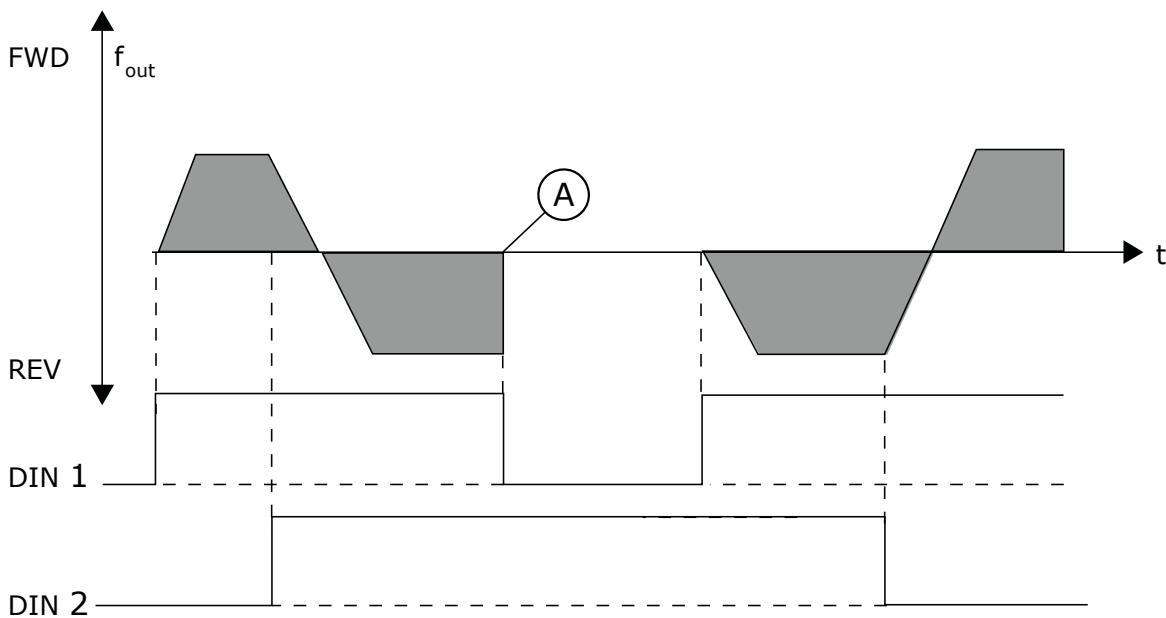




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- |   |   |
|---|---|
| <p>1 The first selected direction has the highest priority.</p> <p>3 If Start forward (DIN 1) and Start reverse (DIN 2) signals are active simultaneously, the Start forward signal (DIN 1) has priority.</p> | <p>2 When the DIN 1 contact opens the direction of rotation starts the change.</p> <p>A Stop function (ID 506) = coasting</p> |
|---|---|

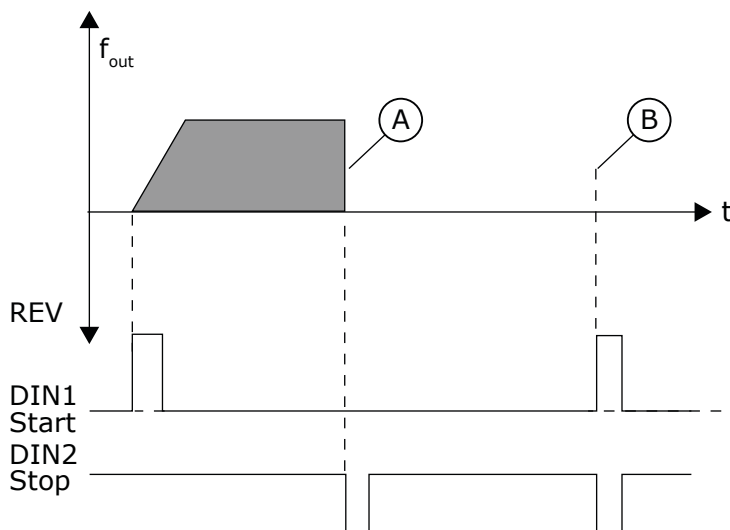
Illustration 31: Start Forward/Start Reverse



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- |  |
|--|
| <p>A Stop function (ID 506) = coasting</p> |
|--|

Illustration 32: Start, Stop, Reverse



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<p><b>A</b> Stop function (ID 506) = coasting</p>	<p><b>B</b> If Start and Stop pulses are simultaneous, the Stop pulse overrides the Start pulse.</p>
---	--

Illustration 33: Start Pulse/ Stop Pulse

### 10.61 (ID 301) DIN 3 Function

Location in the menu:

- P2.17 (Basic Application)
- P2.2.2 (Standard Application, Local/Remote Control Application, Multi-Step Speed Control Application, PID Control Application)

Use this parameter to select the function for the digital input A3.

Table 111: Selections for Parameter ID 301

Selection number	Selection name	Description	Notes
0	Not used		
1	External fault	Closing contact: Fault is shown and responded to according to ID 701.	
2	External fault	Opening contact: Fault is shown and responded to according to ID 701 when the input is not active.	
3	Run enable	Contact open: Motor start disabled and the motor is stopped READY signal is set to FALSE Contact closed: Motor start enabled	
<b>Basic Application</b>			

Selection number	Selection name	Description	Notes
4	Run enable	Contact open: Motor start enabled Contact closed: Motor start disabled and the motor is stopped	
<b>Standard Application, Standard Application, Local/Remote Control Application, Multi-Step Speed Control Application, PID Control Application</b>			
4	Acc./Dec time select.	Contact open: Acceleration/deceleration time 1 selected Contact closed: Acceleration/deceleration time 2 selected	When the control place is forced to change, the values of Start/Stop, Direction, and Reference valid in the respective control place are used (reference according to parameters ID 117, ID 121, and ID 122).
5	Closing contact	Force control place to I/O terminal	The value of parameter ID 125 Keypad Control Place does not change. When DIN 3 opens, the control place is selected according to parameter 3.1.
6	Closing contact	Force control place to keypad	
7	Closing contact	Force control place to fieldbus	
8	Reverse	Contact open: Forward Contact closed: Reverse	Can be used for reversing if parameter ID300 value is set to either 2, 3, or 6.
<b>Local/Remote Control Application, Multi-Step Speed Control Application, PID Control Application</b>			
9	Jogging sp.	Contact closed: Jogging speed selected for frequency reference	
10	Fault reset	Contact closed: Resets all faults	
11	Acc./dec. operation prohibited	Contact closed: Stops acceleration or deceleration until the contact is opened	
12	DC-braking command	Contact closed: In Stop mode, the DC-braking operates until the contact is opened, see Figure 30 and parameters ID 507 and ID 1080	
<b>Local/Remote Control Application, PID Control Application</b>			
13	Motor potentiometer down	Contact closed: Reference decreases until the contact is opened	
<b>Multi-Step Speed Control Application</b>			
13	Preset speed		

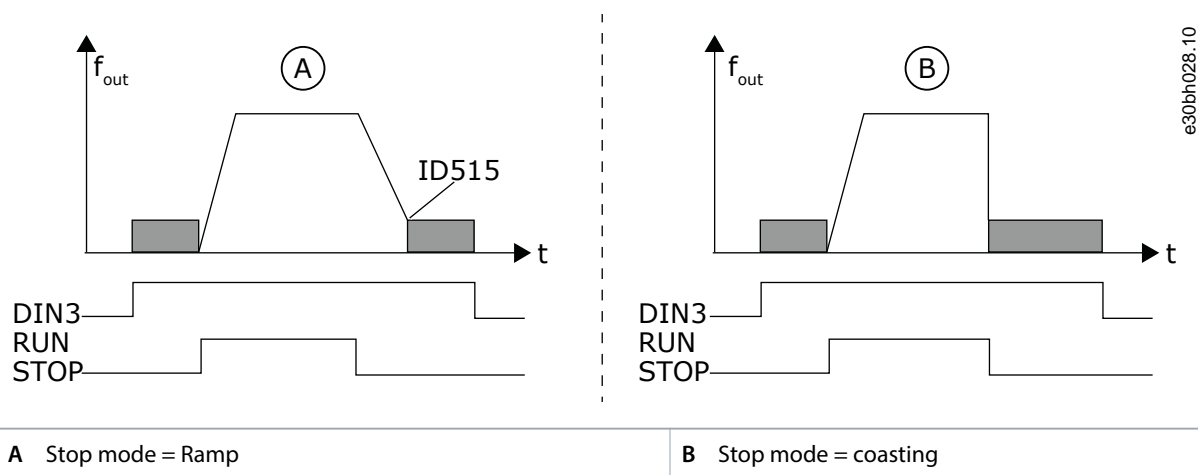


Illustration 34: DIN 3 as DC brake Command Input

### 10.62 (ID 302) Analog Input 2, Reference Offset

Location in the menu:

- P2.15 (Basic Application)
- P2.2.3 (Standard Application)

Use this parameter to set the reference offset for analog input.

Selection number	Selection name	Description
0	No offset: 0–20 mA	
1	Offset 4 mA (“living zero”)	Provides supervision of zero level signal. In Standard Application, the response to reference fault can be programmed with parameter ID 700.

### 10.63 (ID 303) Reference Scaling, Minimum Value

Location in the menu:

- P2.2.4 (Standard Application)
- P2.2.16 (Local/Remote Control Application)
- P2.2.15 (Multi-Step Speed Control Application)
- P2.2.2.6 (Multi-Purpose Control Application)

Use this parameter to set extra reference scaling.

See also [10.64 \(ID 304\) Reference Scaling, Maximum Value](#).

### 10.64 (ID 304) Reference Scaling, Maximum Value

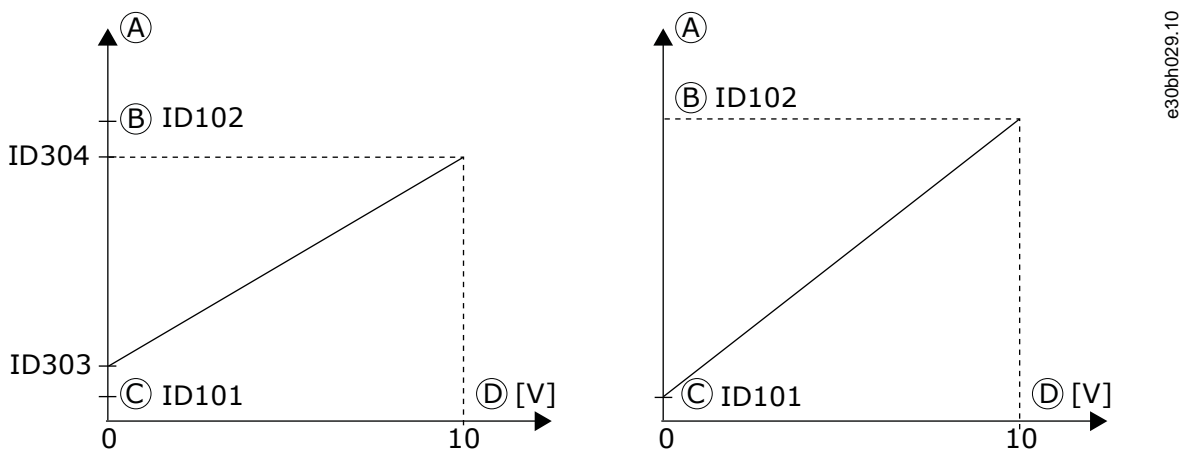
Location in the menu:

- P2.2.5 (Standard Application)
- P2.2.17 (Local/Remote Control Application)
- P2.2.16 (Multi-Step Speed Control Application)
- P2.2.2.7 (Multi-Purpose Control Application)

Use this parameter to set extra reference scaling.

If both parameter ID 303 and parameter ID 304 = 0, scaling is set off. The minimum and maximum frequencies are used for scaling.

This scaling does not affect the fieldbus reference (scaled between Minimum frequency (parameter ID 101) and Maximum frequency (parameter ID 102)).



A $f_{out}$	B $f_{max}$
C $f_{min}$	D AI

Illustration 35: Left: Reference Scaling; Right: No Scaling Used (Parameter ID 303 = 0)

### 10.65 (ID 305) Reference Inversion

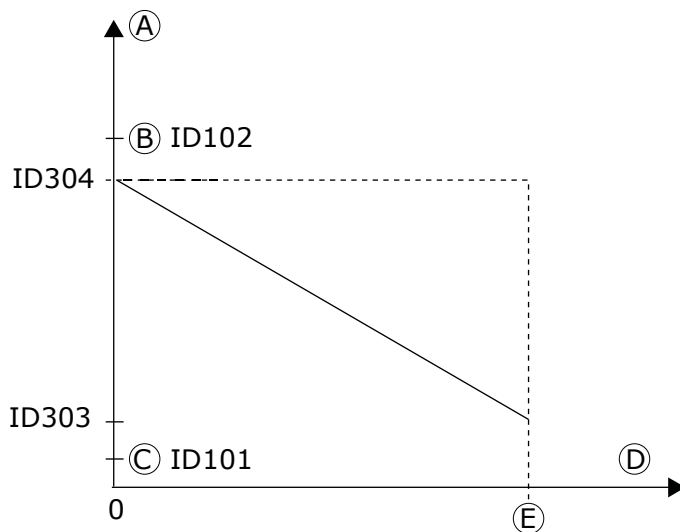
Location in the menu: P2.2.6 (Standard Application)

Use this parameter to invert the reference direction.

Inverts reference signal:

Maximum input signal = Minimum frequency reference

Minimum input signal = Maximum frequency reference



A	$f_{out}$	B	$f_{max}$
C	$f_{min}$	D	maximum
E	AI		

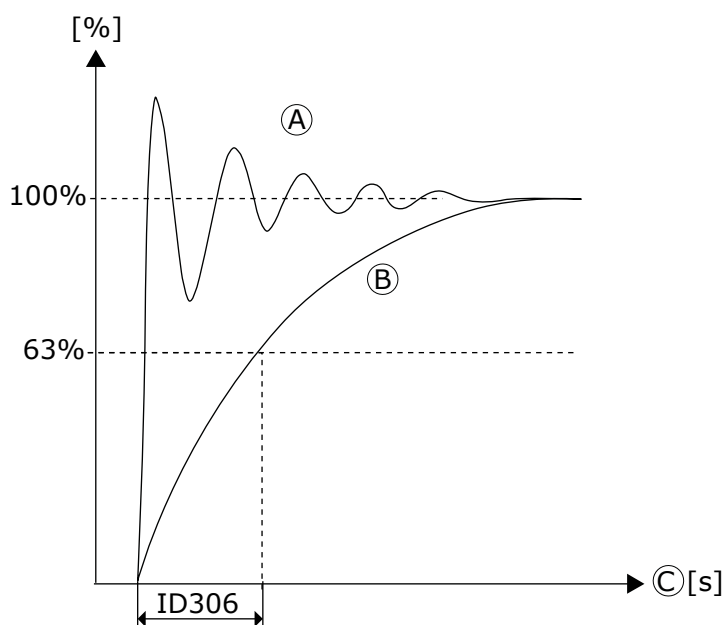
Illustration 36: Reference Invert

### 10.66 (ID 306) Reference Filter Time

Location in the menu: P2.2.7 (Standard Application)

Use this parameter to set the filtering time to filter disturbances from the analog input signals AI1 and AI2.

Long filtering time makes regulation response slower.



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A Unfiltered signal	B Filtered signal
---------------------	-------------------

Illustration 37: Reference Filtering

### 10.67 (ID 307) Analog Output 1 Function

Location in the menu:

- P2.16 (Basic Application)
- P2.3.2 (Standard Application, Local/Remote Control Application, Multi-Step Speed Control Application, PID Control Application)
- P2.3.5.2 (Multi-Purpose Control Application)
- P2.3.3.2 (Pump and Fan Control Application)

Use this parameter to select the function for the analog output 1 signal.

### 10.68 (ID 308) Analog Output 1 Filter Time

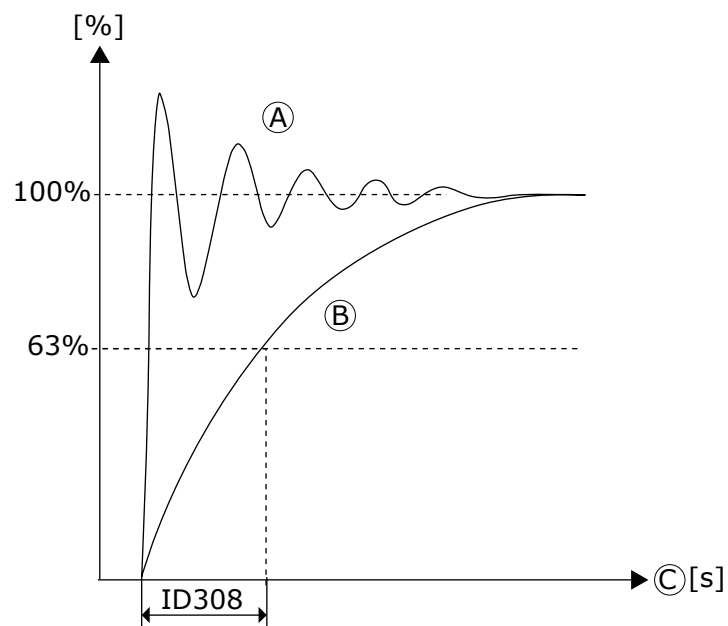
Location in the menu:

- P2.3.3 (Standard Application, Local/Remote Control Application, Multi-Step Speed Control Application, PID Control Application)
- P2.3.5.3 (Multi-Purpose Control Application)
- P2.3.3.3 (Pump and Fan Control Application)

Use this parameter to set the filtering time of the analog output 1 signal.

Setting this parameter value to 0 deactivates filtering.

First order filtering is used for analog output signals.



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A Unfiltered signal	B Filtered signal
C Time	

Illustration 38: Analog Output Filtering

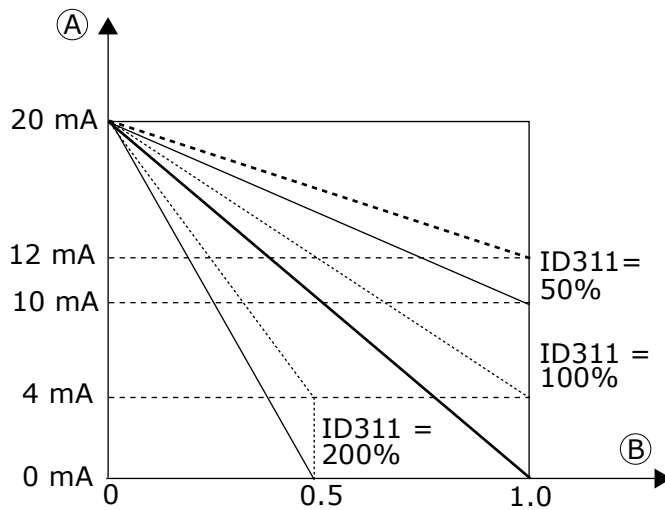
### 10.69 (ID 309) Analog Output 1 Inversion

Location in the menu:

- P2.3.4 (Standard Application, Local/Remote Control Application, Multi-Step Speed Control Application, PID Control Application)
- P2.3.5.4 (Multi-Purpose Control Application)
- P2.3.3.4 (Pump and Fan Control Application)

Use this parameter to invert the analog output 1 signal.





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A Analog output current	B Maximum value of signal selected with ID 307
-------------------------	--

Illustration 39: Analog Output Inverting

Maximum output signal = Minimum set value

Minimum output signal = Maximum set value

See [10.71 \(ID 311\) Analog Output 1 Scale](#).

## 10.70 (ID 310) Analog Output 1 Minimum

Location in the menu:

- P2.3.5 (Standard Application, Local/Remote Control Application, Multi-Step Speed Control Application, PID Control Application)
- P2.3.5.5 (Multi-Purpose Control Application)
- P2.3.3.5 (Pump and Fan Control Application)

Use this parameter to set the minimum value of the analog output 1 signal.

The parameter defines the signal minimum to either 0 mA or 4 mA (living zero). Note the difference in analog output scaling in parameter *ID 311*.

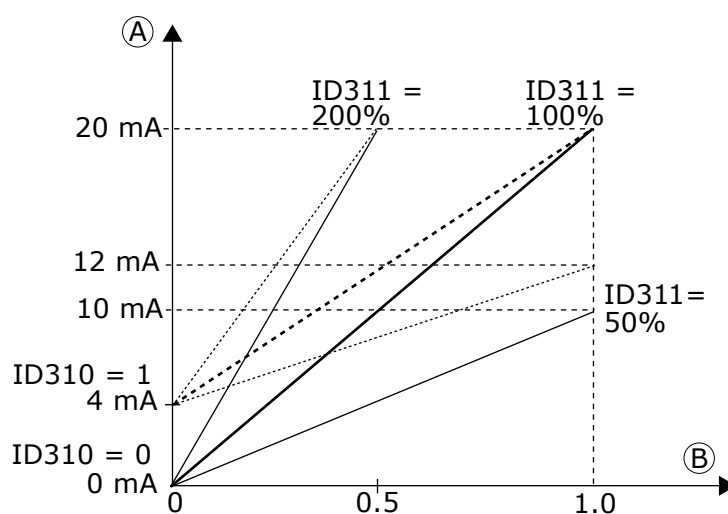
## 10.71 (ID 311) Analog Output 1 Scale

Location in the menu:

- P2.3.6 (Standard Application, Local/Remote Control Application, Multi-Step Speed Control Application, PID Control Application)
- P2.3.5.6 (Multi-Purpose Control Application)
- P2.3.3.6 (Pump and Fan Control Application)

Use this parameter to set the scaling factor for the analog 1 output.

Signal	Max. value of the signal
Output frequency	Max frequency (parameter ID102)
Freq. Reference	Max frequency (parameter ID102)
Motor speed	Motor nom. speed $1 \times n_{mMotor}$
Output current	Motor nom. current $1 \times I_{nMotor}$
Motor torque	Motor nom. torque $1 \times T_{nMotor}$
Motor power	Motor nom. power $1 \times P_{nMotor}$
Motor voltage	$100\% \times U_{nMotor}$
DC-link voltage	1000 V
PI-ref. value	100% x ref. value maximum
PI act. value 1	100% x actual value maximum
PI act. value 2	100% x actual value maximum
PI error value	100% x error value maximum
PI output	100% x output maximum



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A Analog output current	B Maximum value of signal selected with ID 307
-------------------------	--

Illustration 40: Analog Output Scaling

Use this formula to calculate the values:

$$OutputSignal = \frac{Signal * Analogue OutputScale\%}{100\%}$$

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## 10.72 (ID 312) Digital Output Function

Location in the menu:

- **P2.3.7** (Standard Application, Local/Remote Control Application, Multi-Step Speed Control Application, PID Control Application)
- **P2.3.1.2** (Multi-Purpose Control Application)

Use this parameter to select the function for the digital output signal.

Setting value	Signal content
0 = Not used	Out of operation.
1 = Ready	The AC drive is ready to operate.
2 = Run	The AC drive operates (motor is running).
3 = Fault	A fault trip has occurred.
4 = Fault inverted	A fault trip not occurred
5 = AC drive overheat warning	The heat sink temperature exceeds +70 °C.
6 = External fault or warning	Fault or warning depending on parameter ID 701.
7 = Reference fault or warning	Fault or warning depending on parameter ID 700 - if analog reference is 4–20 mA and signal is <4 mA.
8 = Warning	Always if a warning exists.
9 = Reversed	The reverse command has been selected.
10 = Preset speed <sup>(1)</sup>	The preset speed has been selected with digital input.
10 = Jogging speed <sup>(2)</sup>	The jogging speed has been selected with digital input.
11 = At speed	The output frequency has reached the set reference.
12 = Motor regulator activated	One of the limit regulators (for example, current limit, torque limit) is activated.
13 = Output frequency limit 1 supervision	The output frequency goes outside the set supervision low limit/ high limit (see <a href="#">10.75 (ID 315) Output Frequency Limit Supervision Function</a> and <a href="#">10.76 (ID 316) Output Frequency Limit Supervision Value</a> ).
14 = Control from I/O terminals <sup>(1)</sup>	I/O control mode selected (in menu M3)
14 = Output frequency limit 2 supervision <sup>(2)</sup>	The output frequency goes outside the set supervision low limit/ high limit (see <a href="#">10.104 (ID 346) Output Frequency Limit 2 Supervision Function</a> and <a href="#">10.105 (ID 347) Output Frequency Limit 2 Supervision Value</a> ).
15 = Thermistor fault or warning <sup>(1)</sup>	The thermistor input of option board indicates motor overtemperature. Fault or warning depending on parameter ID 732.
15 = Torque limit supervision <sup>(2)</sup>	The motor torque goes beyond the set supervision low limit/high limit (parameters ID 348 and ID 349).
16 = Fieldbus DIN 1 <sup>(1)</sup>	Fieldbus digital input 1. See fieldbus manual.
16 = Reference limit supervision	Active reference goes beyond the set supervision low limit/high limit (parameters ID 350 and ID 351).
17 = External brake control <sup>(2)</sup>	External brake ON/OFF control with programmable delay (parameters ID 352 and ID 353)
18 = Control from I/O terminals <sup>(2)</sup>	External control mode (Menu M3; ID 125)
19 = AC drive temperature limit supervision <sup>(2)</sup>	The AC drive heat sink temperature goes beyond the set supervision limits (parameters ID 354 and ID 355).

Setting value	Signal content
20 = Unrequested rotation direction <sup>(3)</sup>	Rotation direction is different from the requested one.
20 = Reference inverted <sup>(4)</sup>	Rotation direction is different from the requested one.
21 = External brake control inverted <sup>(2)</sup>	External brake ON/OFF control (parameters ID 352 and ID 353); Output active when brake control is OFF.
22 = Thermistor fault or warning <sup>(2)</sup>	The thermistor input of option board indicates motor overtemperature. Fault or warning depending on parameter ID 732.
23 = Fieldbus DIN 1 <sup>(5)</sup>	Fieldbus digital input 1. See fieldbus manual.
23 = Analogue input supervision <sup>(4)</sup>	Selects the analog input to be monitored. See <a href="#">10.114 (ID 356) Analog Supervision Signal</a> , <a href="#">10.115 (ID 357) Analog Supervision Low Limit</a> , <a href="#">10.116 (ID 358) Analog Supervision High Limit</a> , and <a href="#">10.207 (ID 463) Analog Input Supervision Limit</a> .
24 = Fieldbus DIN 1 <sup>(4)</sup>	Fieldbus digital input 1. See fieldbus manual.
25 = Fieldbus DIN 2 <sup>(4)</sup>	Fieldbus digital input 1. See fieldbus manual.
26 = Fieldbus DIN 3 <sup>(4)</sup>	Fieldbus digital input 1. See fieldbus manual.
27 = Temp.Warning <sup>(4)</sup>	

<sup>1</sup> Standard Application

<sup>2</sup> Local/Remote Control Application, Multi-Step Speed Control Application, PID Control Application, Multi-Purpose Control Application

<sup>3</sup> Local/Remote Control Application, Multi-Step Speed Control Application, PID Control Application

<sup>4</sup> Multi-Purpose Control Application

<sup>5</sup> PID Control Application

## 10.73 (ID 313) Relay Output 1 Function

Location in the menu: **P2.3.8** (Standard Application, Local/Remote Control Application, Multi-Step Speed Control Application, PID Control Application)

Use this parameter to select the function for the relay output signal.

See [10.72 \(ID 312\) Digital Output Function](#).

## 10.74 (ID 314) Relay Output 2 Function

Location in the menu: **P2.3.9** (Standard Application, Local/Remote Control Application, Multi-Step Speed Control Application, PID Control Application)

Use this parameter to select the function for the relay output signal.

See [10.72 \(ID 312\) Digital Output Function](#).

## 10.75 (ID 315) Output Frequency Limit Supervision Function

Location in the menu:

- **P2.3.10** (Standard Application, Local/Remote Control Application, Multi-Step Speed Control Application, PID Control Application)
- **P2.3.2.1** (Pump and Fan Control Application)
- **P2.3.4.1** (Multi-Purpose Control Application)

Use this parameter to select the limit supervision function for the output frequency.

If the output frequency goes under/over the set limit (*ID 316*), this function generates a message via digital output depending on:

- the settings of parameters *ID 312* to *ID 314* (Standard Application, Local/Remote Control Application, Multi-Step Speed Control Application) or
- to which output the supervision signal 1 (*ID 447*) is connected (Multi-Purpose Control Application, Pump and Fan Control Application).

Selection "Brake-on control" is available only for Multi-Purpose Control Application. See [10.519 External Brake Control with Additional Limits \(IDs 315, 316, 346–349, 352, 353\)](#).

Brake control uses different output functions. See [10.189 \(ID 445\) External Brake Control](#) and [10.190 \(ID 446\) External Brake Control, Inverted](#).

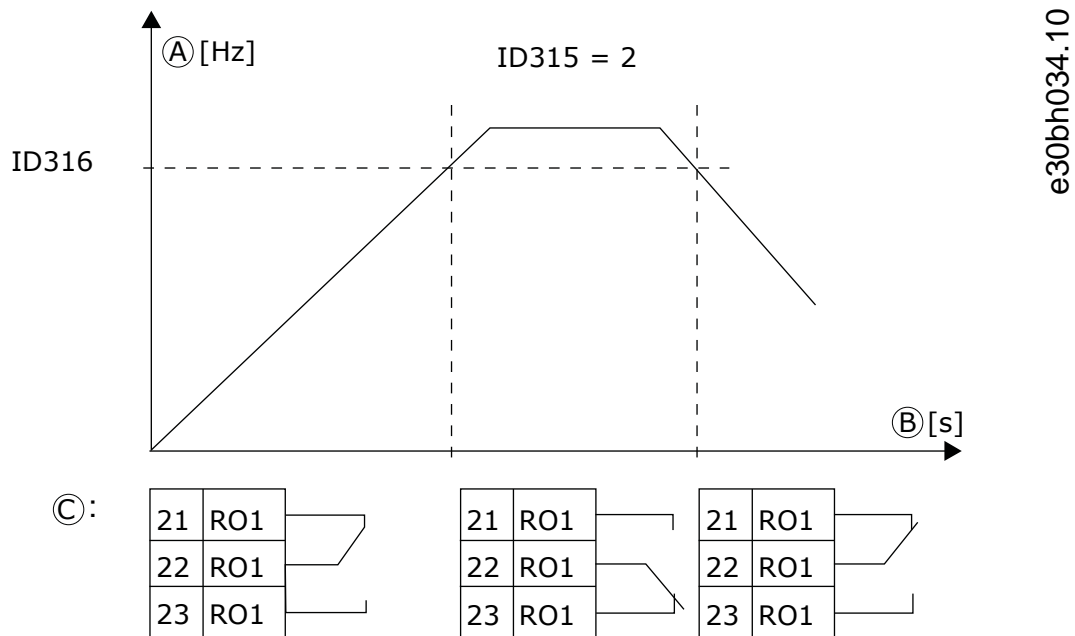
## 10.76 (ID 316) Output Frequency Limit Supervision Value

Location in the menu:

- **P2.3.11** (Standard Application, Local/Remote Control Application, Multi-Step Speed Control Application, PID Control Application)
- **P2.3.2.2** (Pump and Fan Control Application)
- **P2.3.4.2** (Multi-Purpose Control Application)

Use this parameter to set the limit supervision value for the output frequency when activating the limit supervision function.

Selects the frequency value supervised by parameter *ID 315*.



A Frequency	B Time
C Example	

Illustration 42: Output Frequency Supervision

### 10.77 (ID 319) DIN 2 Function

Location in the menu: P2.2.1 (PID Control Application)

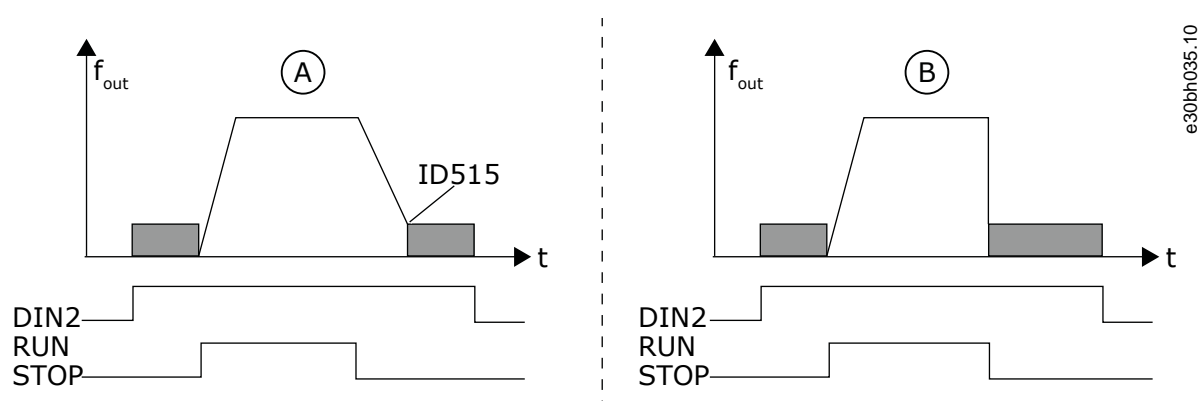
Use this parameter to select the function for the digital input signal.

This parameter has 14 selections. If digital input DIN 2 is not needed, set the parameter value to 0.

Table 112: Selections for Parameter ID 319

Selection number	Selection name	Description	Notes
1	External fault, normally open	Contact closed: Fault is shown and motor stopped when the input is active	
2	External fault, normally closed	Contact open: Fault is shown and motor stopped when the input is not active.	
3	Run enable	Contact open, Start of motor disabled.	
		Contact closed: Start of motor enabled	

Selection number	Selection name	Description	Notes
4	Acceleration or deceleration time selection	Contact open, Acceleration/Deceleration time 1 selected	
		Contact closed: Acceleration/Deceleration time 2 selected	
5	Closing contact	Force control place to I/O terminal	When the control place is forced to change, the values of Start/Stop, Direction, and Reference valid in the respective control place are used (reference according to parameters ID 343, ID 121, and ID 122).  The value of ID 125 (Keypad Control Place) does not change.  When DIN 2 opens, the control place is selected according to keypad control place selection.
6	Closing contact	Force control place to keypad	
7	Closing contact	Force control place to fieldbus	
8	Reverse	Contact open: Forward	If several inputs are programmed to reverse, one active contact is enough to set the direction to reverse.
		Contact closed: Reverse	
9	Jogging speed	Contact closed: Jogging speed selected for frequency reference	See <a href="#">10.22 (ID 124) Jogging Speed Reference</a>
10	Fault reset	Contact closed: Resets all faults	
11	Acceleration/ Deceleration prohibited	Contact closed: No acceleration or deceleration possible until the contact is opened	
12	DC-braking command	Contact closed: In Stop mode, the DC braking operates until the contact is opened. See <a href="#">illustration 43</a>	
13	Motor potentiometer UP	Contact closed: Reference increases until the contact is opened.	



**A** Stop mode = Ramp

**B** Stop mode = Coasting

Illustration 43: DC Braking Command (Selection 12) Selected for DIN 2



## 10.78 (ID 320) AI1 Signal Range

Location in the menu:

- **P2.2.4** (Local/Remote Control Application, Multi-Step Speed Control Application)
- **P2.2.16** (PID Control Application)
- **P2.2.2.3** (Multi-Purpose Control Application, Pump and Fan Control Application)

Use this parameter to select the range for the analog input signal.

For selection 'Customized', see parameters *ID 321* and *ID 322*.

## 10.79 (ID 321) AI1 Custom Setting Minimum

Location in the menu:

- **P2.2.5** (Local/Remote Control Application, Multi-Step Speed Control Application)
- **P2.2.17** (PID Control Application)
- **P2.2.2.4** (Multi-Purpose Control Application, Pump and Fan Control Application)

Use this parameter to adjust the minimum value of the analog input signal between -160%...160% freely.

## 10.80 (ID 322) AI1 Custom Setting Maximum

Location in the menu:

- **P2.2.6** (Local/Remote Control Application, Multi-Step Speed Control Application)
- **P2.2.18** (PID Control Application)
- **P2.2.2.5** (Multi-Purpose Control Application, Pump and Fan Control Application)

Use this parameter to adjust the maximum value of the analog input signal between -160%...160% freely.

Use the analog input signal, for example, as frequency reference, and set these 2 parameters between 40–80%. In these conditions, the frequency reference changes between the *Minimum frequency reference (ID 101)* and the *Maximum frequency reference (ID 102)*, and the analog input signal changes between 8–16 mA.

## 10.81 (ID 323) AI1 Signal Inversion

Location in the menu:

- **P2.2.7** (Local/Remote Control Application, Multi-Step Speed Control Application)
- **P2.2.19** (PID Control Application)
- **P2.2.2.6** (Pump and Fan Control Application)

Use this parameter to invert the analog input signal.

If this parameter = 0, no inversion of analog input signal takes place.

In Local/Remote Control Application, AI1 is place B frequency reference when parameter *ID 131* = 0 (default).

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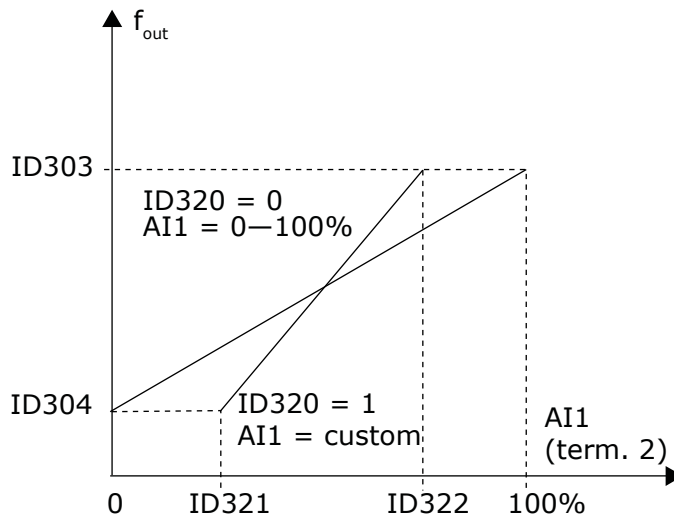


Illustration 44: AI1 No Signal Inversion

If this parameter = 1 inversion of analog input signal takes place.

Maximum AI1 signal = minimum frequency reference

Minimum AI1 signal = maximum frequency reference

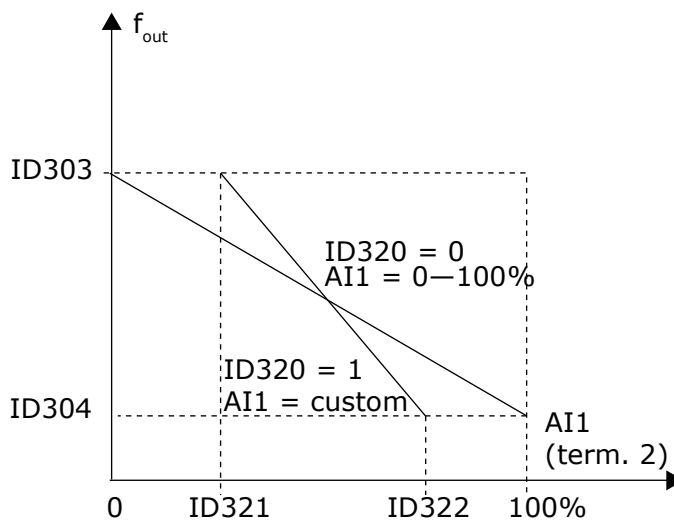


Illustration 45: AI1 Signal Inversion

## 10.82 (ID 324) AI1 Signal Filter Time

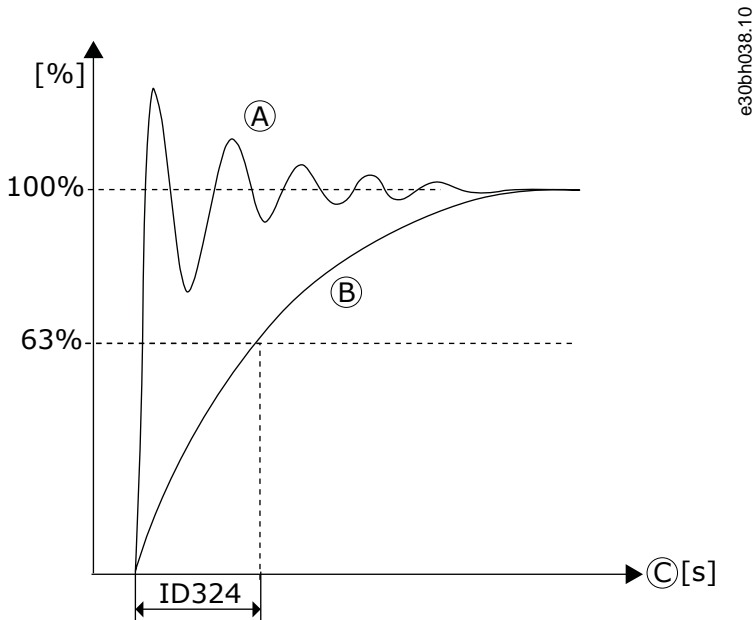
Location in the menu:

- P2.2.8 (Local/Remote Control Application, Multi-Step Speed Control Application)
- P2.2.20 (PID Control Application)
- P2.2.2.2 (Multi-Purpose Control Application, Pump and Fan Control Application)

Use this parameter to filter out disturbances in the analog input signal.

To activate this parameter, give it a value that is bigger than 0.

Long filtering time makes the regulation response slower.



A Unfiltered signal	B Filtered signal
C Time	

Illustration 46: AI1 Signal Filtering

### 10.83 (ID 325) AI2 Signal Range

Location in the menu:

- P2.2.10 (Local/Remote Control Application, Multi-Step Speed Control Application)
- P2.2.22 (PID Control Application)
- P2.2.3.3 (Multi-Purpose Control Application, Pump and Fan Control Application)

Use this parameter to select the range for the analog input signal.

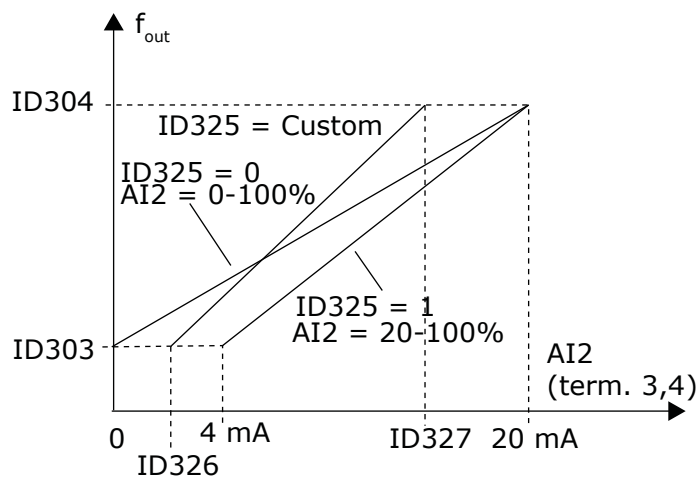
### 10.84 (ID 326) AI2 Custom Setting Minimum

Location in the menu:

- P2.2.11 (Local/Remote Control Application, Multi-Step Speed Control Application)
- P2.2.23 (PID Control Application)
- P2.2.3.4 (Multi-Purpose Control Application, Pump and Fan Control Application)

Use this parameter to adjust the minimum value of the analog input signal between -160%...160% freely.

See [10.80 \(ID 322\) AI1 Custom Setting Maximum](#).



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Illustration 47: Analog input AI2 scaling

### 10.85 (ID 327) AI2 Custom Setting Maximum

Location in the menu:

- P2.2.12 (Local/Remote Control Application, Multi-Step Speed Control Application)
- P2.2.24 (PID Control Application)
- P2.2.3.5 (Multi-Purpose Control Application, Pump and Fan Control Application)

Use this parameter to adjust the maximum value of the analog input signal between -160%...160% freely.

See [10.84 \(ID 326\) AI2 Custom Setting Minimum](#).

### 10.86 (ID 328) AI2 Inversion

Location in the menu:

- P2.2.13 (Local/Remote Control Application, Multi-Step Speed Control Application)
- P2.2.25 (PID Control Application)
- P2.2.3.6 (Multi-Purpose Control Application, Pump and Fan Control Application)

Use this parameter to invert the analog input signal.

See [10.81 \(ID 323\) AI1 Signal Inversion](#).

In Local/Remote Control Application, AI2 is the place A frequency reference, when parameter ID 117 = 1 (default).

### 10.87 (ID 329) AI2 Filter Time

Location in the menu:

- **P2.2.13** (Local/Remote Control Application, Multi-Step Speed Control Application)
- **P2.2.25** (PID Control Application)
- **P2.2.3.6** (Multi-Purpose Control Application, Pump and Fan Control Application)

Use this parameter to filter out disturbances in the analog input signal.

See [10.82 \(ID 324\) AI1 Signal Filter Time](#).

## 10.88 (ID 330) DIN 5 Function

Location in the menu: **P2.2.3** (PID Control Application)

Use this parameter to select the function for the digital input signal.

The digital input DIN 5 has 14 possible functions. If it is not needed, set the value of this parameter to 0.

The selections are the same as in parameter *ID 319* except:

13 Enable PID reference 2:

- Contact open: PID controller reference selected with parameter *ID 332*.
- Contact closed: PID controller keypad reference 2 selected with parameter *R3.5*.

## 10.89 (ID 331) Motor Potentiometer Ramp Time

Location in the menu:

- **P2.2.22** (Local/Remote Control Application)
- **P2.2.27** (PID Control Application)
- **P2.2.1.2** (Multi-Purpose Control Application)
- **P2.2.1.15** (Pump and Fan Control Application)

Use this parameter to set the rate of change in the motor potentiometer reference when it is increased or decreased.

Motor control ramp times are still active.

## 10.90 (ID 332) PID Controller Reference Signal

Location in the menu: **P2.1.11** (PID Control Application, Pump and Fan Control Application)

Use this parameter to select the source of the PID controller signal.

For selection "Fieldbus ref. (FBProcessDataIN1)" (3 in PID Control Application and 5 in Pump and Fan Control Application), see [10.523 Fieldbus Control Parameters \(IDs 850–859\)](#).

## 10.91 (ID 333) PID Controller Actual Value Selection

Location in the menu:

- **P2.2.8** (PID Control Application)
- **P2.2.1.8** (Pump and Fan Control Application)

Use this parameter to select the actual value of the PID controller signal.

## 10.92 (ID 334) Actual Value 1 Selection

Location in the menu:

- **P2.2.9** (PID Control Application)
- **P2.2.1.9** (Pump and Fan Control Application)

Use this parameter to select the source of the actual value.

For selection "Fieldbus" (5), see [10.523 Fieldbus Control Parameters \(IDs 850–859\)](#).

## 10.93 (ID 335) Actual Value 2 Selection

Location in the menu:

- **P2.2.10** (PID Control Application)
- **P2.2.1.10** (Pump and Fan Control Application)

Use this parameter to select the source of the actual value.

For selection "Fieldbus" (5), see [10.523 Fieldbus Control Parameters \(IDs 850–859\)](#).

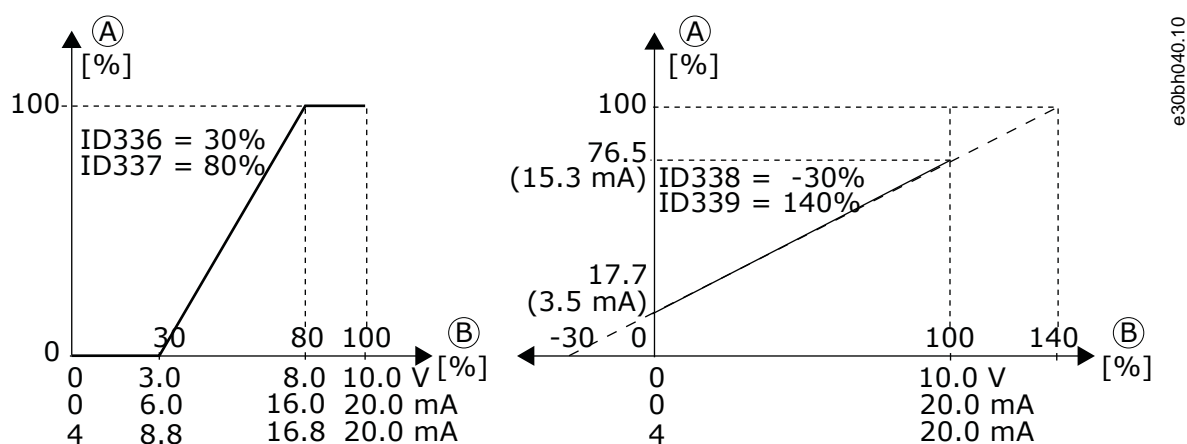
## 10.94 (ID 336) Actual Value 1 Minimum Scale

Location in the menu:

- **P2.2.11** (PID Control Application)
- **P2.2.1.11** (Pump and Fan Control Application)

Use this parameter to set the minimum scaling point of the actual value.

Sets the maximum scaling point for Actual value 2. See [illustration 48](#).



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A Scaled input signal	B AI
-----------------------	------

Illustration 48: Examples of Actual Value Signal Scaling

### 10.95 (ID 337) Actual Value 1 Maximum Scale

Location in the menu:

- P2.2.12 (PID Control Application)
- P2.2.1.12 (Pump and Fan Control Application)

Use this parameter to set the maximum scaling point of the actual value.

 See [10.94 \(ID 336\) Actual Value 1 Minimum Scale](#).

### 10.96 (ID 338) Actual Value 2 Minimum Scale

Location in the menu:

- P2.2.13 (PID Control Application)
- P2.2.1.13 (Pump and Fan Control Application)

Use this parameter to set the minimum scaling point of the actual value.

 See [10.94 \(ID 336\) Actual Value 1 Minimum Scale](#).

### 10.97 (ID 339) Actual Value 2 Maximum Scale

Location in the menu:

- P2.2.14 (PID Control Application)
- P2.2.1.14 (Pump and Fan Control Application)

Use this parameter to set the maximum scaling point of the actual value.

 See [10.94 \(ID 336\) Actual Value 1 Minimum Scale](#).

### 10.98 (ID 340) PID Error Value Inversion

Location in the menu:

- **P2.2.32** (PID Control Application)
- **P2.2.1.15** (Pump and Fan Control Application)

Use this parameter to invert the error value of the PID controller.

### 10.99 (ID 341) PID Reference Rise Time

Location in the menu:

- **P2.2.33** (PID Control Application)
- **P2.2.1.6** (Pump and Fan Control Application)

Use this parameter to set the time during which the PID controller reference rises from 0% to 100%.

### 10.100 (ID 342) PID Reference Fall Time

Location in the menu:

- **P2.2.34** (PID Control Application)
- **P2.2.1.7** (Pump and Fan Control Application)

Use this parameter to set the time during which the PID controller reference falls from 100% to 0%.

### 10.101 (ID 343) I/O Reference Selection

Location in the menu:

- **P2.2.5** (PID Control Application)
- **P2.2.1.1** (Pump and Fan Control Application)

Use this parameter to select the frequency reference source when I/O terminal is the control place and the reference source B is active.

Selection number	Selection name	Description
0	AI1 reference	(terminals 2 and 3, for example, potentiometer)
1	AI2 reference	(terminals 5 and 6, for example, transducer)
2	AI3 reference	
3	AI4 reference	
4	Keypad reference (parameter R3.2)	
5	Reference from Fieldbus (FBSpeedReference)	
6	Motor potentiometer reference	
7	PID controller reference	



Select actual value (parameter ID 333 to ID 339) and the PID control reference (parameter ID 332). If value 6 is selected for this parameter in PID Control Application, the values of parameters ID 319 and ID 301 are automatically set to 13.

In Pump and Fan Control Application, the functions Motor potentiometer DOWN and Motorpotentiometer UP must be connected to digital inputs (parameters ID 417 and ID 418), if value 6 is selected for this parameter.

### 10.102 (ID 344) Reference Scaling Minimum Value, Place B

Location in the menu:

- P2.2.35 (PID Control Application)
- P2.2.1.18 (Pump and Fan Control Application)

Use this parameter to set the minimum scaling point of the reference value.

### 10.103 (ID 345) Reference Scaling Maximum Value

Location in the menu:

- P2.2.36 (PID Control Application)
- P2.2.1.19 (Pump and Fan Control Application)

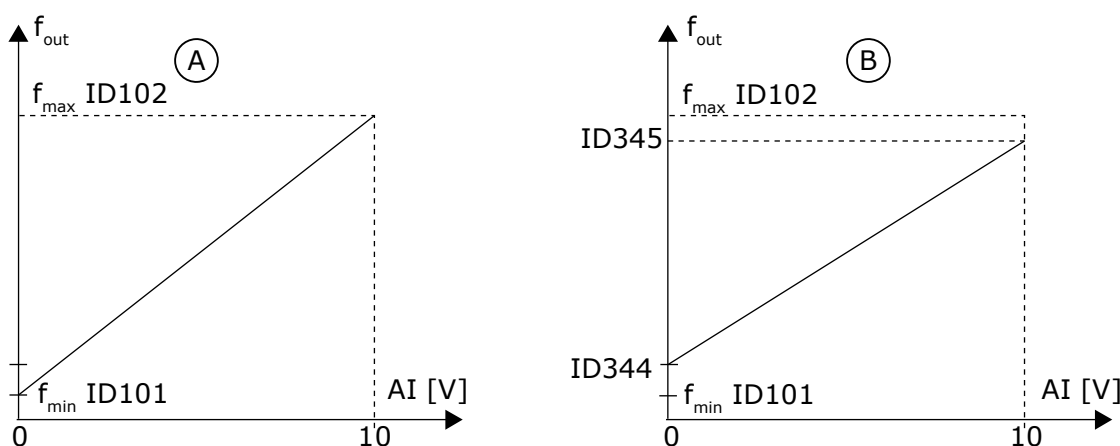
Use this parameter to set the maximum scaling point of the reference value.

You can select a scaling range for the frequency reference from control place B between the Minimum and Maximum frequency.

If no scaling is desired set the parameter value to 0.

In [illustration 49](#), input AI1 with signal range 0–100% is selected for Place B reference.

This scaling does not affect the fieldbus reference (scaled between Minimum frequency (parameter ID 101) and Maximum frequency (parameter ID 102)).



A Parameter ID 344 = 0 (No reference scaling)	B Reference scaling
---	---------------------

Illustration 49: Reference scaling maximum value

## 10.104 (ID 346) Output Frequency Limit 2 Supervision Function

Location in the menu:

- **P2.3.12** (Local/Remote Control Application, Multi-Step Speed Control Application, PID Control Application)
- **P2.3.4.3** (Multi-Purpose Control Application)
- **P2.3.2.3** (Pump and Fan Control Application)

Use this parameter to select the limit supervision function for the output frequency.

If the output frequency goes under/over the set limit (*ID 347*), this function generates a warning message through a digital output depending on:

- the settings of parameters *ID 312* to *ID 314* (Local/Remote Control Application, Multi-Step Speed Control Application, PID Control Application), or
- to which output the supervision signal 2 (*ID 448*) is connected (Multi-Purpose Control Application, Pump and Fan Control Application).

Brake control (only in Multi-Purpose Control Application) uses different output functions. See parameters *ID 445* & *ID 446* and [10.519 External Brake Control with Additional Limits \(IDs 315, 316, 346–349, 352, 353\)](#).

## 10.105 (ID 347) Output Frequency Limit 2 Supervision Value

Location in the menu:

- **P2.3.13** (Local/Remote Control Application, Multi-Step Speed Control Application, PID Control Application)
- **P2.3.4.4** (Multi-Purpose Control Application)
- **P2.3.2.4** (Pump and Fan Control Application)

Use this parameter to set the limit supervision value for the output frequency when activating the limit supervision function.

Selects the frequency value supervised by parameter ID 346. See [illustration 42](#).

## 10.106 (ID 348) Torque Limit, Supervision Function

Location in the menu:

- **P2.3.14** (Local/Remote Control Application, Multi-Step Speed Control Application, PID Control Application)
- **P2.3.4.5** (Multi-Purpose Control Application)
- **P2.3.2.5** (Pump and Fan Control Application)

Use this parameter to select the limit supervision function for the calculated torque value.

If the calculated torque value falls below or exceeds the set limit (*ID 349*), this function generates a message through a digital output depending on:

- the settings of parameters *ID 312* to *ID 314* (Local/Remote Control Application, Multi-Step Speed Control Application, PID Control Application), or
- to which output the torque limit supervision signal (parameter *ID 451*) is connected (Multi-Purpose Control Application, Pump and Fan Control Application).

For more information on selection Brake-off control (only in Multi-Purpose Control Application), see [10.519 External Brake Control with Additional Limits \(IDs 315, 316, 346–349, 352, 353\)](#).

### 10.107 (ID 349) Torque Limit, Supervision Value

Location in the menu:

- **P2.3.15** (Local/Remote Control Application, Multi-Step Speed Control Application, PID Control Application)
- **P2.3.4.6** (Multi-Purpose Control Application)
- **P2.3.2.6** (Pump and Fan Control Application)

Use this parameter to set the limit supervision value for the torque when activating the torque limit supervision function.

Set here the torque value that the parameter *ID 348* must supervise.

**Local/Remote Control Application, Multi-Step Speed Control Application:** Torque supervision value can be reduced below the setpoint with external free analog input signal selection and selected function, see parameters *ID 361* and *ID 362*.

### 10.108 (ID 350) Reference Limit, Supervision Function

Location in the menu:

- **P2.3.16** (Local/Remote Control Application, Multi-Step Speed Control Application, PID Control Application)
- **P2.3.4.7** (Multi-Purpose Control Application)
- **P2.3.2.7** (Pump and Fan Control Application)

Use this parameter to select the limit supervision function for the reference value.

If the reference value falls below or exceeds the set limit (*ID 351*), this function generates a warning through a digital output depending on:

- the settings of parameters *ID 312* to *ID 314* (Local/Remote Control Application, Multi-Step Speed Control Application, PID Control Application), or
- to which output the reference limit supervision signal (parameter *ID 449*) is connected (Multi-Purpose Control Application, Pump and Fan Control Application).

The supervised reference is the current active reference. It can be place A or B reference depending on DIN 6 input, I/O reference, panel reference, or fieldbus reference.

### 10.109 (ID 351) Reference Limit, Supervision Value

Location in the menu:

- **P2.3.17** (Local/Remote Control Application, Multi-Step Speed Control Application, PID Control Application)
- **P2.3.4.8** (Multi-Purpose Control Application)
- **P2.3.2.8** (Pump and Fan Control Application)

Use this parameter to set the limit supervision value for the reference value when activating the reference limit supervision function.

The frequency value to be supervised with the parameter *ID 350*. Give the value in percent of the scale between the minimum and maximum frequencies.

### 10.110 (ID 352) External Brake-off Delay

Location in the menu:

- P2.3.18 (Local/Remote Control Application, Multi-Step Speed Control Application, PID Control Application)
- P2.3.4.9 (Multi-Purpose Control Application)
- P2.3.2.9 (Pump and Fan Control Application)

Use this parameter to set the delay time to open the brake after the conditions to open the brake are filled.

See [10.111 \(ID 353\) External Brake-On Delay](#).

### 10.111 (ID 353) External Brake-On Delay

Location in the menu:

- P2.3.19 (Local/Remote Control Application, Multi-Step Speed Control Application, PID Control Application)
- P2.3.4.10 (Multi-Purpose Control Application)
- P2.3.2.10 (Pump and Fan Control Application)

Use this parameter to set the delay time to close the brake after the conditions to close the brake are filled.

The function of the external brake can be timed to the start and stop control signals with these parameters. See [illustration 50](#) and [10.519 External Brake Control with Additional Limits \(IDs 315, 316, 346–349, 352, 353\)](#).

The brake control signal can be programmed via the digital output DO1 or via one of the relay outputs RO1 and RO2. See parameters *ID 312 to ID 314* (Local/Remote Control Application, Multi-Step Speed Control Application, PID Control Application) or *ID 445* (Multi-Purpose Control Application, Pump, and Fan Control Application). The brake-on delay is ignored when the unit is reaching a stop state after a ramp-down or if stopped by coasting.

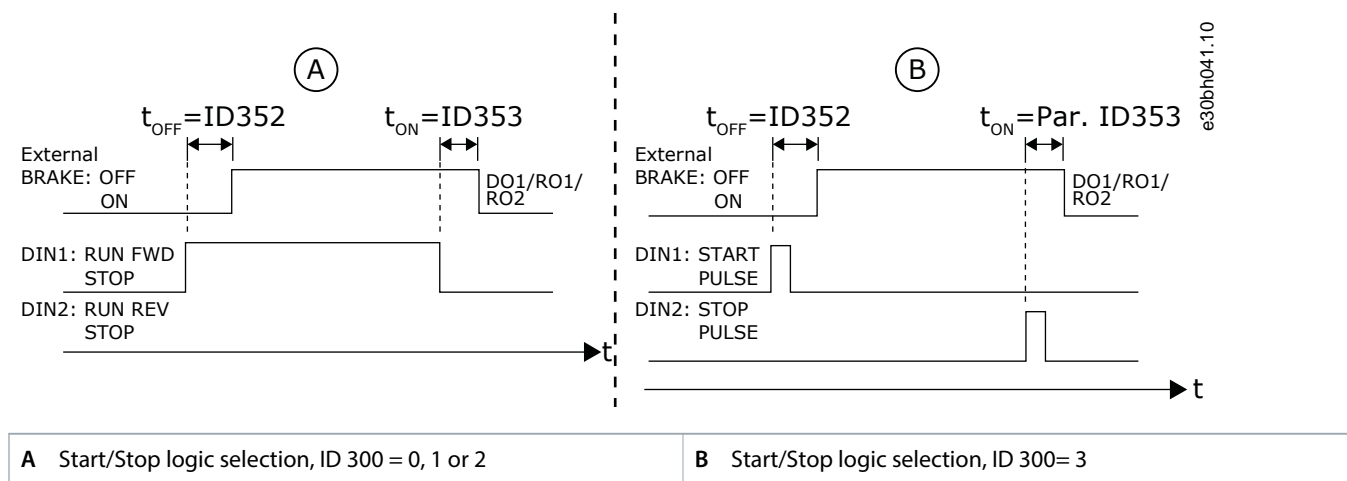


Illustration 50: External Brake Control

### 10.112 (ID 354) Frequency Converter Temperature Limit Supervision

Location in the menu:

- P2.3.20 (Local/Remote Control Application, Multi-Step Speed Control Application, PID Control Application)
- P2.3.4.11 (Multi-Purpose Control Application)
- P2.3.2.11 (Pump and Fan Control Application)

Use this parameter to select the limit supervision function for the temperature of the AC drive.

If the temperature of the AC drive unit falls below or exceeds the set limit (*ID 355*), this function generates a message through a digital output depending on:

- the settings of parameters *ID 312* to *ID 314* (Local/Remote Control Application, Multi-Step Speed Control Application, PID Control Application), or
- to which output the temperature limit supervision signal (parameter *ID 450*) is connected (Multi-Purpose Control Application, Pump and Fan Control Application).

For more information on selection Brake-off control (only in Multi-Purpose Control Application), see [10.519 External Brake Control with Additional Limits \(IDs 315, 316, 346–349, 352, 353\)](#).

### 10.113 (ID 355) Frequency Converter Temperature Limit Value

Location in the menu:

- **P2.3.21** (Local/Remote Control Application, Multi-Step Speed Control Application, PID Control Application)
- **P2.3.4.12** (Multi-Purpose Control Application)
- **P2.3.2.12** (Pump and Fan Control Application)

Use this parameter to set the limit supervision value for the temperature when activating the temperature limit supervision function.

Parameter *ID 354* supervises this temperature value.

### 10.114 (ID 356) Analog Supervision Signal

Location in the menu: **P2.3.4.13** (Multi-Purpose Control Application)

Use this parameter to select the analog input to monitor.

### 10.115 (ID 357) Analog Supervision Low Limit

Location in the menu: **P2.3.4.14** (Multi-Purpose Control Application)

Use this parameter to set the low limit for the analog input selected to be monitored.

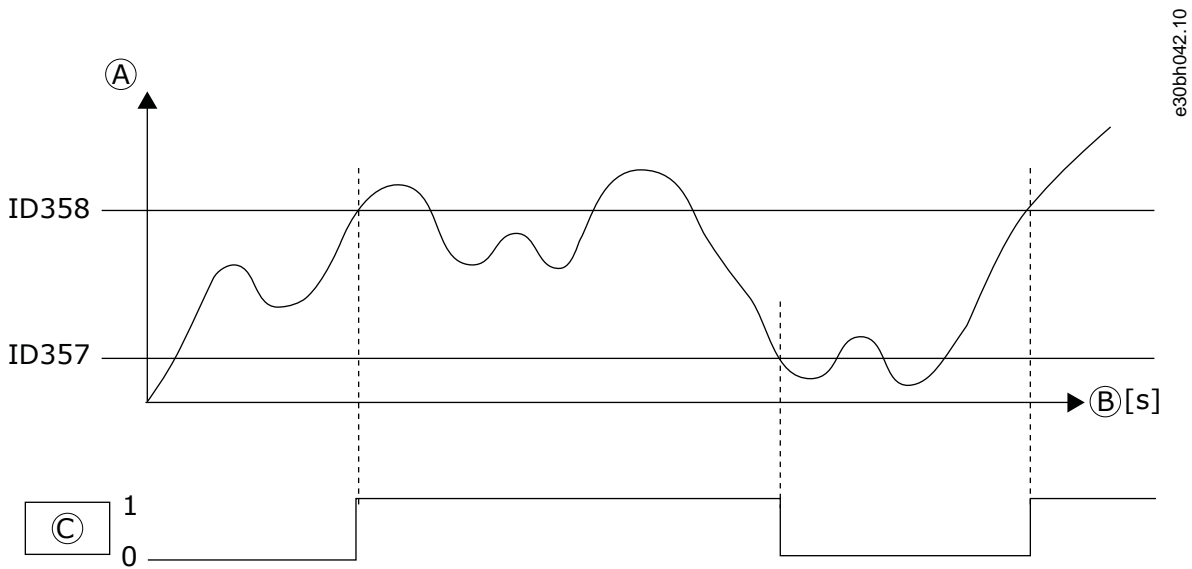
See [10.116 \(ID 358\) Analog Supervision High Limit](#).

### 10.116 (ID 358) Analog Supervision High Limit

Location in the menu: **P2.3.4.15** (Multi-Purpose Control Application)

Use this parameter to set the high limit for the analog input selected to be monitored.

These parameters set the low and high limits of the signal selected with parameter *ID 356*.



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A AI, selected with parameter ID 356	B Time
C RO1	

Illustration 51: An Example of On/Off-control

In this example, the programming of parameter ID 463 = B.1.

### 10.117 (ID 359) PID Controller Minimum Limit

Location in the menu: P2.2.30 (PID Control Application)

Use this parameter to set the minimum limit for the PID controller output.

These limits are of importance, for example, when defining the gain, I-time, and D-time for the PID controller.

### 10.118 (ID 360) PID Controller Maximum Limit

Location in the menu: P2.2.31 (PID Control Application)

Use this parameter to set the maximum limit for the PID controller output.

Limit setting:  $-1600.0\%$  (of  $f_{max}$ ) < parameter ID 359 < parameter ID 360 <  $1600.0\%$  (of  $f_{max}$ ).

These limits are of importance, for example, when defining the gain, I-time, and D-time for the PID controller.

### 10.119 (ID 361) Free Analog Input, Signal Selection

Location in the menu:

- P2.2.20 (Local/Remote Control Application)
- P2.2.17 (Multi-Step Speed Control Application)

Use this parameter to select the input signal for an analog input that is not in use for reference signal.

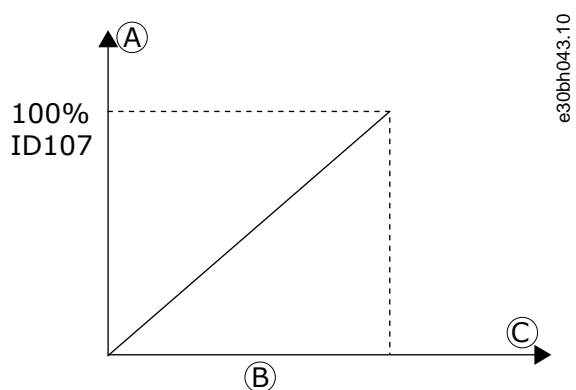
### 10.120 (ID 362) Free Analog Input, Function

Location in the menu:

- P2.2.21 (Local/Remote Control Application)
- P2.2.18 (Multi-Step Speed Control Application)

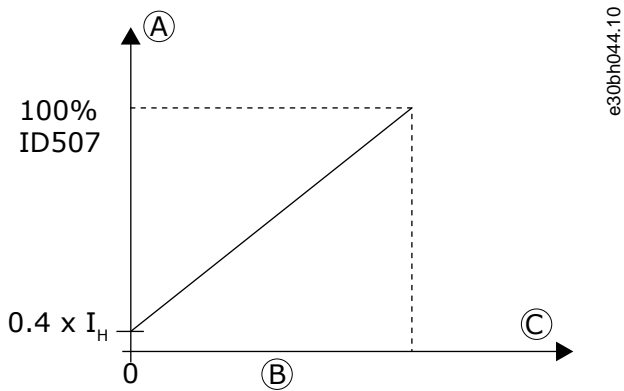
Use this parameter to select the function for an analog input that is not in use for reference signal.

Selection number	Selection name	Description
0	Function is not in use.	
1	Reduces motor current limit (ID 107)	This signal adjusts the maximum motor current between 0 and maximum limit set with ID 107. See <a href="#">illustration 52</a> .
2	Reduces DC brake current	DC brake current can be reduced with the free analog input signal between zero current and the current set with the parameter ID 507. See <a href="#">illustration 53</a> .
3	Reduces acceleration and deceleration times	Acceleration and deceleration times can be reduced with the free analog input signal according to the following formulas: Reduced time = set acc./deceler. time (parameters ID103, ID104; ID502, ID503) divided by the factor R in <a href="#">illustration 54</a> .
4	Reduces torque supervision limit	Set supervision limit can be reduced with the free analog input signal between 0 and set torque limit supervision value (ID349), see <a href="#">illustration 55</a> .



A Torque limit	B Signal range (0–10 V, 0–20 mA, 4–20 mA, or Custom)
C AI	

Illustration 52: Scaling of Maximum Motor Current

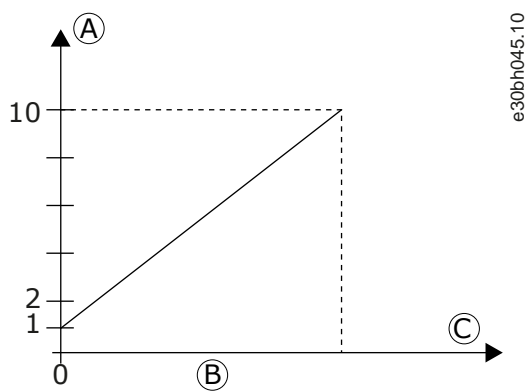


A DC-braking current

B Signal range

C Free analog input

Illustration 53: Reduction of DC Braking Current



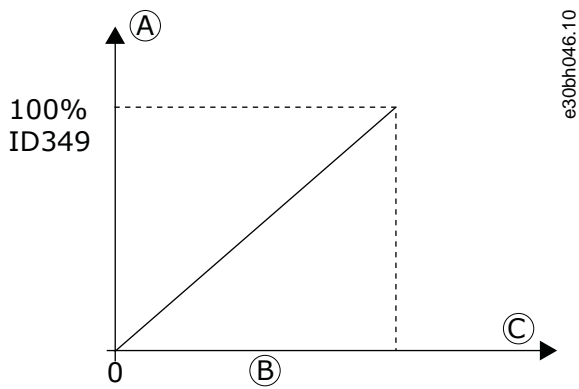
A Factor R

B Signal range

C Free analog input

Illustration 54: Reduction of Acceleration and Deceleration Times





A Torque limit	B Signal range
C Free analog input	

Illustration 55: Reduction of Torque Supervision Limit

### 10.121 (ID 363) Start/Stop Logic Selection, Place B

Location in the menu: P2.2.15 (Local/Remote Control Application)

Use this parameter to control the start and stop of the drive with the digital signals.

Selection	DIN 3	DIN 4	DIN 5
0 <sup>(1)</sup>		closed contact = start forward	closed contact = start reverse
1 <sup>(2)</sup>		closed contact = start open contact = stop	closed contact = reverse open contact = forward
2		closed contact = start open contact = stop	closed contact = start enabled open contact = start disabled and drive stopped if running
3 <sup>(3) (4)</sup>	Can be programmed for reverse command.	closed contact = start pulse	open contact = stop pulse
4 <sup>(5)</sup>		closed contact = start forward (Rising edge required to start) <sup>(6)</sup>	closed contact = start reverse (Rising edge required to start) <sup>(6)</sup>
5 <sup>(5)</sup>		closed contact = start reverse (Rising edge required to start) <sup>(6)</sup> open contact = stop	closed contact = reverse open contact = forward
6 <sup>(5)</sup>		closed contact = start reverse (Rising edge required to start) <sup>(6)</sup> open contact = stop	closed contact = start enabled open contact = start disabled and drive stopped if running

<sup>1</sup> See [illustration 56](#).

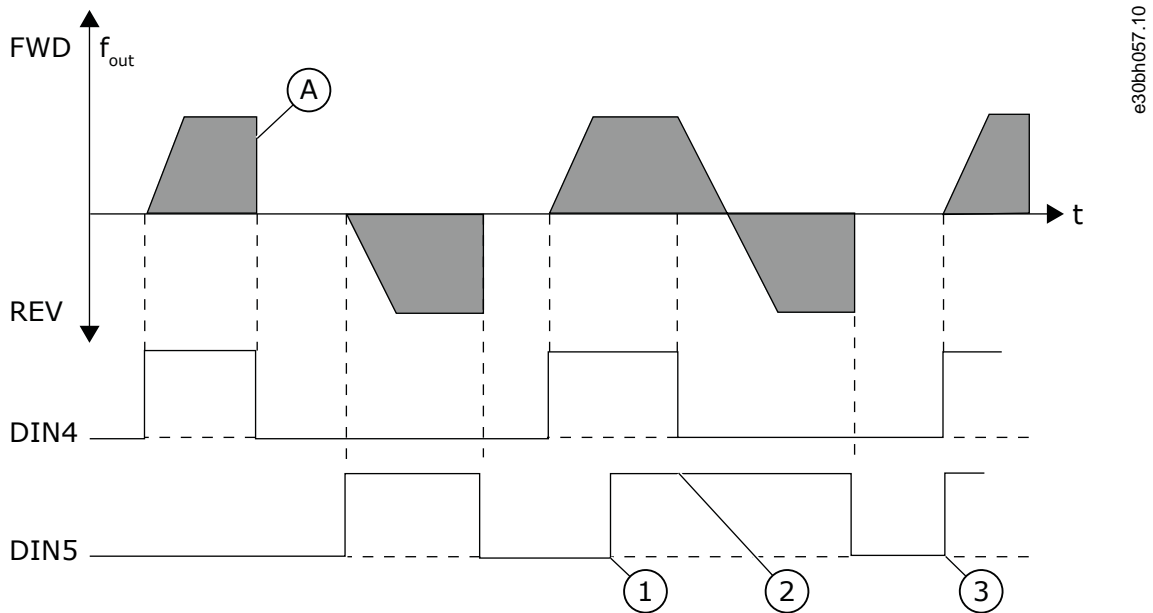
<sup>2</sup> See [illustration 57](#).

<sup>3</sup> See [illustration 58](#).

<sup>4</sup> 3-wire connection (pulse control)

<sup>5</sup> The selections 4–6 are used to exclude the possibility of an unintentional start when, for example, power is connected, reconnected after a power failure, after a fault reset, after Run Enable (Run Enable = False) stops the drive or when the control place is changed. The Start/Stop contact must be opened before the motor can be started.

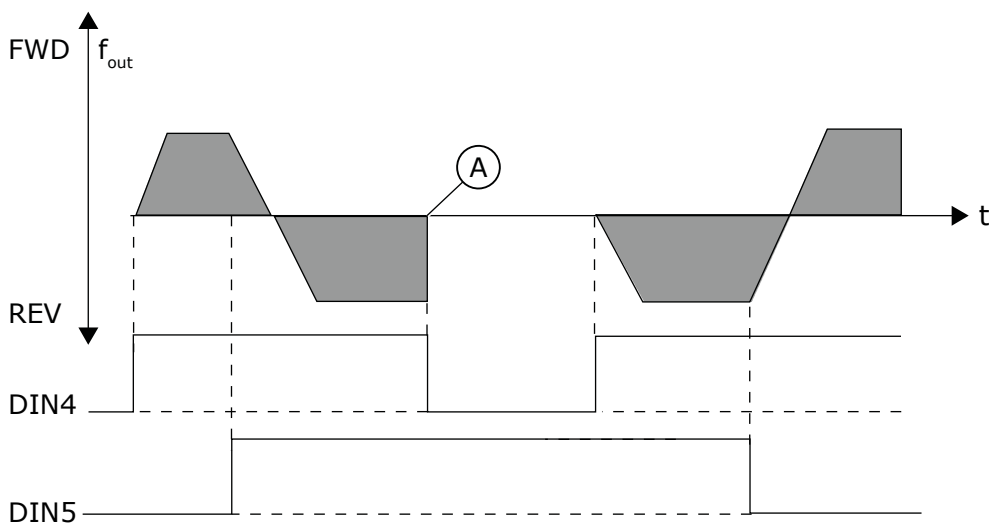
<sup>6</sup> The selections including the text 'Rising edge required to start' are used to exclude the possibility of an unintentional start when, for example, power is connected, reconnected after a power failure, after a fault reset, after the drive is stopped by Run Enable (Run Enable = False) or when the control place is changed from I/O control. The Start/Stop contact must be opened before the motor can be started.



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- |   |  |
|---|--|
| 1. The first selected direction has the highest priority. | 2. When the DIN 4 contact opens the direction of rotation starts the change. |
| 3. Start pulse/ Stop pulse.                               | A Stop function (ID 506) = coasting.   |

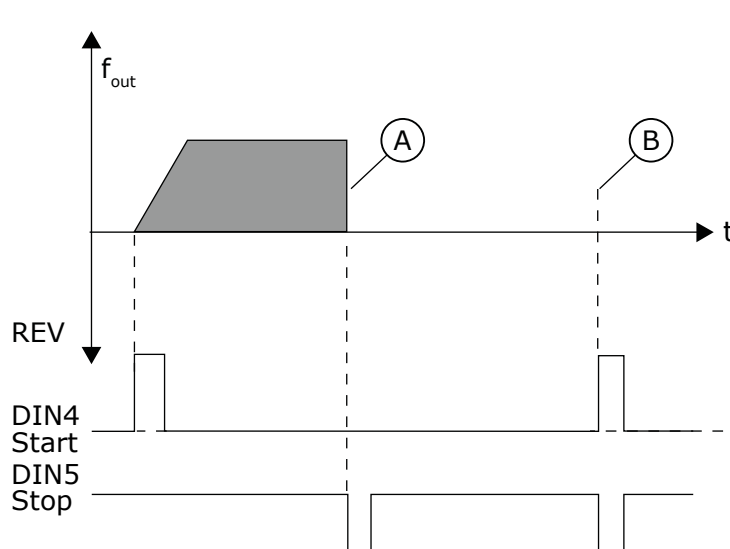
Illustration 56: Start Forward/Start Reverse



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- |                                      |
|--------------------------------------|
| A Stop function (ID 506) = coasting. |
|--------------------------------------|

Illustration 57: Start, Stop, Reverse



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**A** Stop function (ID 506) = coasting.

**B** If Start and Stop pulses are simultaneous the Stop pulse overrides the Start pulse.

Illustration 58: Start Pulse/ Stop Pulse

### 10.122 (ID 364) Reference Scaling, Minimum Value

Location in the menu: **P2.2.18** (Local/Remote Control Application)

Use this parameter to set extra reference scaling.

See parameters *ID 303* and *ID 304*.

### 10.123 (ID 365) Reference Scaling, Maximum Value

Location in the menu: **P2.2.19** (Local/Remote Control Application)

Use this parameter to set extra reference scaling.

See parameters *ID 303* and *ID 304*.

### 10.124 (ID 366) Easy Changeover

Location in the menu: **P2.2.37** (PID Control Application)

Use this parameter to select copy reference function.

If Copy reference has been selected, it is possible to switch from direct control to PID control and back without scaling the reference and actual value.

For example: The process is driven with direct frequency reference (Control place I/O B, fieldbus, or keypad) to some point. Then the control place is switched to one where the PID controller is selected. The PID control starts to maintain that point.

It is also possible to change the control source back to direct frequency control. In this case, the output frequency is copied as the frequency reference. If the destination place is Keypad, the run status (Run/Stop, Direction, and Reference) is copied.

The changeover is smooth when the reference of the destination source comes from the Keypad or an internal motor potentiometer (parameter *ID 332* [PID Ref.] = 2 or 4, *ID 343* [I/O B Ref] = 2 or 4, parameter *ID 121* [Keypad Ref] = 2 or 4 and *ID 122* [Fieldbus Ref]= 2 or 4).

### 10.125 (ID 367) Motor Potentiometer Reset

Location in the menu:

- **P2.2.23** (Local/Remote Control Application)
- **P2.2.28** (PID Control Application)
- **P2.2.1.3** (Multi-purpose Control Application)
- **P2.2.1.16** (Pump and Fan Control Application)

Use this parameter to set the logic for the resetting of the frequency reference of the motor potentiometer.

This parameter defines when the reference of the motor potentiometer is set to 0. There are 3 selections in the reset function: no reset, reset when the drive stops, or reset when the drive is powered down.

Selection number	Selection name	Description
0	No reset	The last motor potentiometer frequency reference is kept through the stop state and kept in memory when a power-down occurs.
1	Stop state	The motor potentiometer frequency reference is set to 0 when the drive goes to the stop state, or when the drive is powered down.
2	Powered down	The motor potentiometer frequency reference is set to 0 only when a power-down occurs.

### 10.126 (ID 370) Motor Potentiometer Memory Reset (Frequency Reference)

Location in the menu:

- **P2.2.29** (PID Control Application)
- **P2.2.1.17** (Pump and Fan Control Application)

Use this parameter to set the logic for the resetting of the PID reference of the motor potentiometer.

### 10.127 (ID 371) PID Reference 2 (Place A Additional Reference)

Location in the menu: **P2.2.1.4** (Pump and Fan Control Application)

Use this parameter to select the reference place for PID controller reference when PID reference is activated.

These parameters set the low and high limits of the signal selected with parameter *ID 356*.

If the PID reference 2 enables input function (*ID 330*)= TRUE, this parameter defines which reference place is selected as PID controller reference.

Selection	Selection name	Description
0	AI1 reference	(terminals 2 and 3, for example, potentiometer)
1	AI2 reference	(terminals 5 and 6, for example, transducer)
2	AI3 reference	
3	AI4 reference	
4	PID reference 1 from keypad	
5	Reference from Fieldbus (FBProcessDataIN3)	See <a href="#">10.523 Fieldbus Control Parameters (IDs 850–859)</a> .
6	Motor potentiometer	If value 6 is selected for this parameter, the functions Motor potentiometer DOWN and Motor potentiometer UP must be connected to digital inputs (parameters ID 417 and ID 418).
7	PID reference 2 from keypad	

### 10.128 (ID 372) Supervised Analog Input

Location in the menu: **P2.3.2.13** (Pump and Fan Control Application)

Use this parameter to select the analog input for which to set the limit supervision function.

### 10.129 (ID 373) Analog Input Limit Supervision

Location in the menu: **P2.3.2.14** (Pump and Fan Control Application)

Use this parameter select the limit supervision function for the selected analog input.

If the value of the selected analog input goes under/over the set supervision value (parameter *ID 374*), this function generates a message. The message is generated through the digital output or the relay outputs depending on to which output the analog input supervision function (parameter *ID 463*) is connected.

### 10.130 (ID 374) Analog Input Limit Value

Location in the menu: **P2.3.2.15** (Pump and Fan Control Application)

Use this parameter to set the limit supervision value for the selected analog input when activating the limit supervision function.

The parameter *ID 373* supervises the value of the selected analog input.

### 10.131 (ID 375) Analog Output 1 Offset

Location in the menu:

- **P2.3.3.7** (Pump and Fan Control Application)
- **P2.3.5.7** (Multi-purpose Control Application)

Use this parameter to add offset to the analog output 1.

Add -100.0% to 100.0% to the analog output signal.

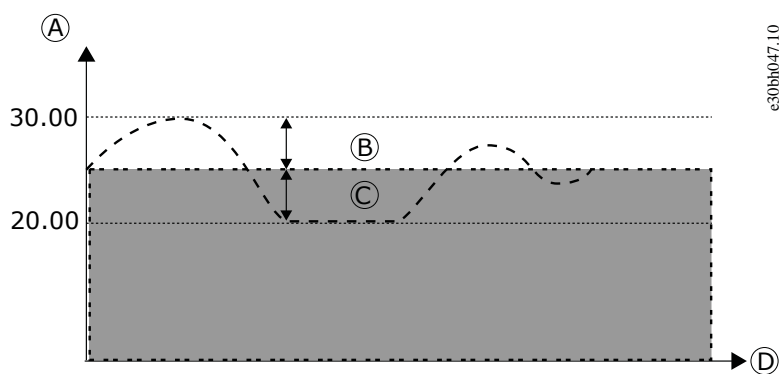
### 10.132 (ID 376) PID Sum Point Reference (Place A Direct Reference)

Location in the menu: P2.2.4 (PID Control Application)

Use this parameter to select extra reference sources to the PID controller output when PID controller is used.

Selection number	Selection name	Description
0	No additional reference	(Direct PID output value)
1	PID output + AI1 reference from terminals 2 and 3 (for example, potentiometer)	
2	PID output + AI2 reference from terminals 4 and 5 (for example, transducer)	
3	PID output + PID keypad reference	
4	PID output + Fieldbus reference (FBSpeedReference)	
5	PID output + Motor potentiometer reference	
6	PID output + Fieldbus + PID output (ProcessDataIN3)	See <a href="#">10.523 Fieldbus Control Parameters (IDs 850–859)</a> .
7	PID output + Motor potentiometer	

If value 7 is selected for this parameter, the values of parameters ID 319 and ID 301 are automatically set to 13.



A Frequency	B PID Maximum limit
C PID Minimum limit	D Time

Illustration 59: PID sum point reference

The maximum and minimum limits illustrated in the picture limit only the PID output, no other outputs.

### 10.133 (ID 377) AI1 Signal Selection

Location in the menu:

- P2.2.8 (Standard Application)
- P2.2.3 (Local/Remote Control Application, Multi-step Speed Control Application)
- P2.2.15 (PID Control Application)
- P2.2.2.1 (Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to connect the AI signal to the analog input of your selection.

TTF programming method must be applied to this parameter see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

### 10.134 (ID 384) AI1 Joystick Hysteresis

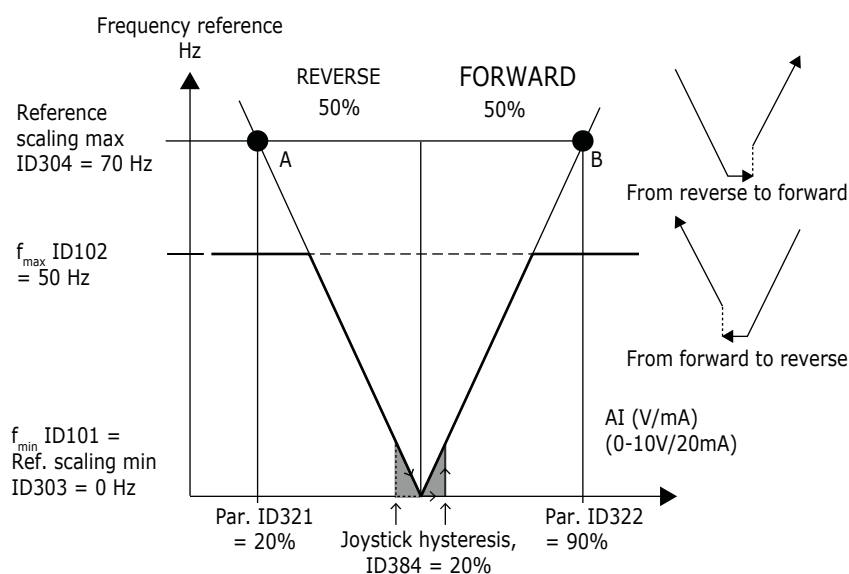
Location in the menu: P2.2.2.8 (Multi-purpose Control Application)

Use this parameter to set the joystick hysteresis.

This parameter defines the joystick hysteresis between 0–20%.

When the joystick or potentiometer control is turned from reverse to forward, the output frequency falls linearly to the selected minimum frequency (joystick/ potentiometer in center position). It stays there until the joystick/potentiometer is turned towards the forward command. It depends on the amount of joystick hysteresis defined with this parameter, how much the joystick/potentiometer must be turned to start the increase of the frequency towards the selected maximum frequency.

If the value of this parameter is 0, the frequency starts to increase linearly immediately when the joystick/potentiometer is turned towards the forward command from the center position. When the control is changed from forward to reverse, the frequency follows the same pattern the other way round.



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Illustration 60: An Example of Joystick Hysteresis

In the example figure, the value of parameter ID 385 (Sleep limit) = 0

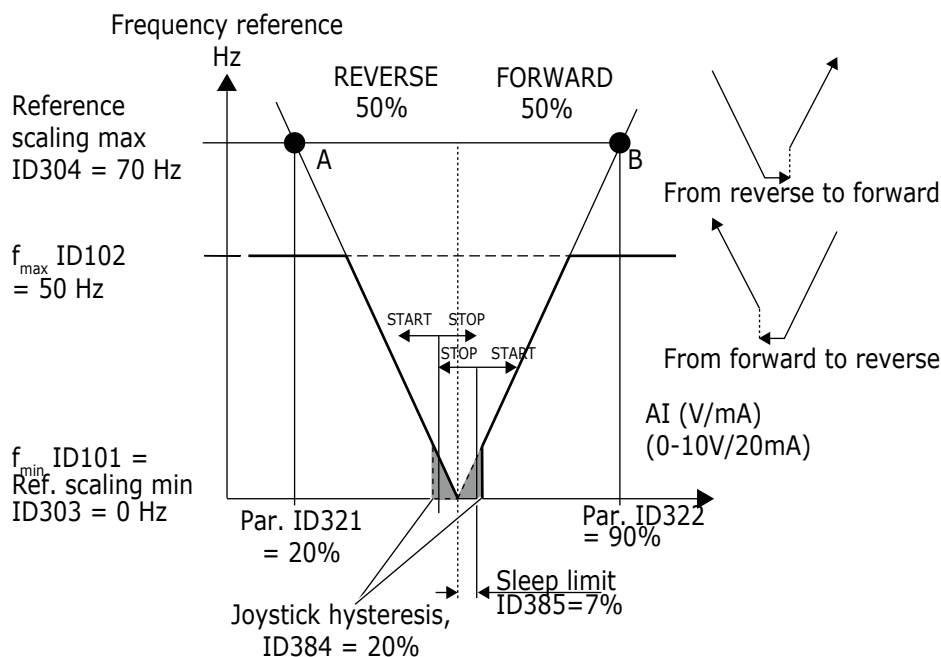


### 10.135 (ID 385) AI1 Sleep Limit

Location in the menu: P2.2.2.9 (Multi-purpose Control Application)

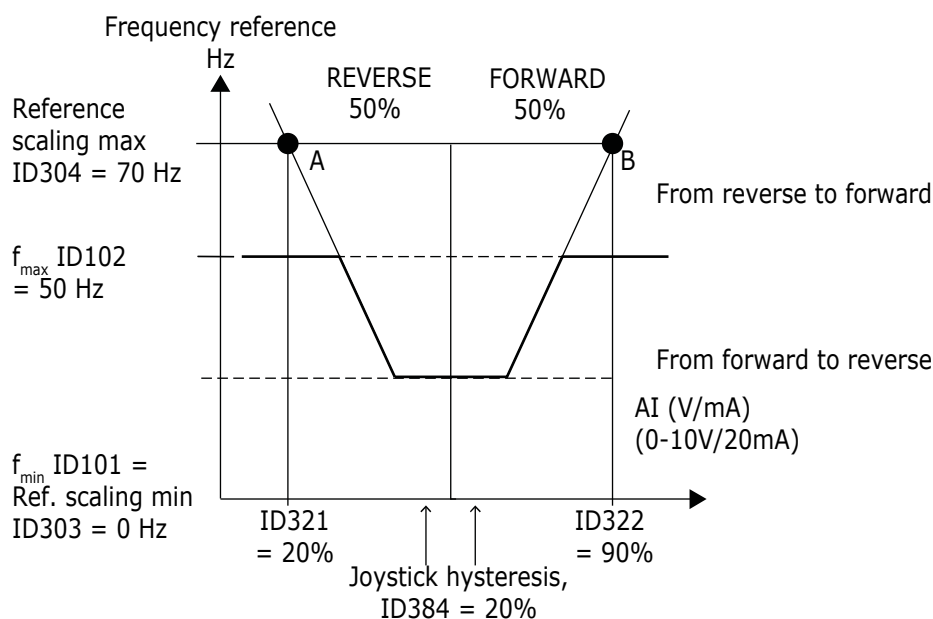
Use this parameter to set the sleep limit. The AC drive stops automatically if the AI signal level falls below the value set with this parameter.

See also [10.136 \(ID 386\) AI1 Sleep Delay](#) and [illustration 61](#).



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Illustration 61: Example of Sleep Limit Function



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Illustration 62: Joystick Hysteresis with Minimum Frequency at 35 Hz

### 10.136 (ID 386) AI1 Sleep Delay

Location in the menu: P2.2.2.10 (Multi-purpose Control Application)

Use this parameter to set the time during which the analog input signal must stay under the sleep limit before the AC drive stops.

This parameter defines the time the analog input signal has to stay under the sleep limit determined with parameter ID 385 to stop the AC drive.

### 10.137 (ID 388) AI2 Signal Selection

Location in the menu:

- P2.2.9 (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application)
- P2.2.21 (PID Control Application)
- P2.2.3.1 (Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to connect the AI2 signal to the analog input of your selection.

 TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

### 10.138 (ID 393) AI2 Reference Scaling, Minimum Value

Location in the menu: P2.2.3.6 (Multi-purpose Control Application)

Use this parameter to set extra reference scaling.

If the values of both *ID 393* and *ID 394* are zero, the scaling is set off. The minimum and maximum frequencies are used for scaling. See parameters *ID 303* and *ID 304*.

### 10.139 (ID 394) AI2 Reference Scaling, Maximum Value

Location in the menu: **P2.2.3.7** (Multi-purpose Control Application)

Use this parameter to set extra reference scaling.

If the values of both *ID 393* and *ID 394* are zero, the scaling is set off. The minimum and maximum frequencies are used for scaling. See parameters *ID 303* and *ID 304*.

### 10.140 (ID 395) AI2 Joystick Hysteresis

Location in the menu: **P2.2.3.8** (Multi-purpose Control Application)

Use this parameter to set the joystick hysteresis.

This parameter defines the joystick dead zone between 0–20%. See *ID 384*.

### 10.141 (ID 396) AI2 Sleep Limit

Location in the menu: **P2.2.3.9** (Multi-purpose Control Application)

Use this parameter to set the sleep limit. The AC drive stops automatically if the AI signal level falls below the value set with this parameter.

See also parameter *ID 397* and [illustration 62](#). See *ID 385*.

### 10.142 (ID 397) AI2 Sleep Delay

Location in the menu: **P2.2.3.10** (Multi-purpose Control Application)

Use this parameter to set the time during which the analog input signal must stay under the sleep limit before the AC drive stops.

### 10.143 (ID 399) Scaling of Current Limit

Location in the menu: **P2.2.6.1** (Multi-purpose Control Application)

Use this parameter to select the signal to adjust the maximum value of the motor current.

For selection 5 "Fieldbus (FB ProcessDataIN2)", see [10.523 Fieldbus Control Parameters \(IDs 850–859\)](#).

This signal adjusts the maximum motor current between 0 and *Motor current limit (ID 107)*.

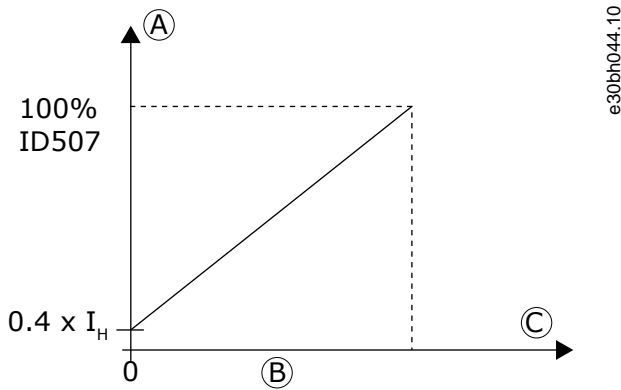
### 10.144 (ID 400) Scaling of DC-Braking Current

Location in the menu: **P2.2.6.2** (Multi-purpose Control Application)

Use this parameter to select the signal to adjust the DC-braking current.

See parameter *ID 399* for the selections.

DC-braking current can be reduced with the free analog input signal between zero current and the current set with parameter *ID 507*.



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Illustration 63: Scaling of DC-Braking Current

### 10.145 (ID 401) Scaling of Acceleration and Deceleration Times

Location in the menu: **P2.2.6.3** (Multi-purpose Control Application)

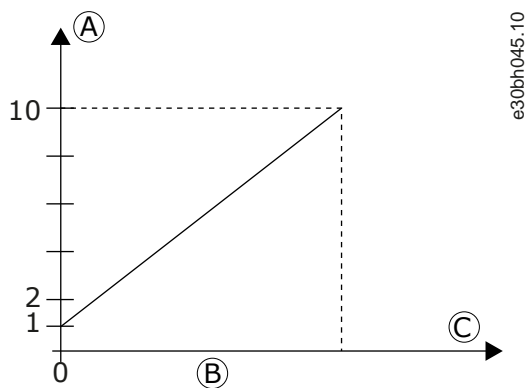
Use this parameter to select the signal to adjust the acceleration and deceleration times.

See parameter *ID 399*.

Acceleration and deceleration times can be reduced with the free analog input signal according to the following formulas:

Reduced time = set acc./deceler. time (parameters *ID 103*, *ID 104*; *ID 502*, *ID 503*) divided by the factor R from [illustration 64](#).

Analog input level zero corresponds to ramp times set by parameters. Maximum level is a tenth of value set by parameter.



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Illustration 64: Reducing of Acceleration and Deceleration Times

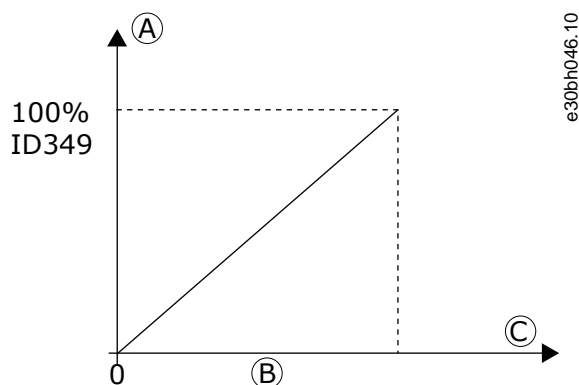
### 10.146 (ID 402) Scaling of Torque Supervision Limit

Location in the menu: **P2.2.6.4** (Multi-purpose Control Application)

Use this parameter to select the signal to adjust the torque supervision limit.

See *ID 399*.

The set torque supervision limit can be reduced with the free analog input signal between 0 and the set supervision limit, *ID 349*.



**Illustration 65: Reducing Torque Supervision Limit**

### 10.147 (ID 403) Start Signal 1

Location in the menu: **P2.2.7.1** (Multi-purpose Control Application)

Use this parameter to select the digital input signal (Control Signal 1) that starts and stops the drive when the control place is I/O A (FWD).

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

Default programming A.1.

### 10.148 (ID 404) Start Signal 2

Location in the menu: **P2.2.7.2** (Multi-purpose Control Application)

Use this parameter to select the digital input signal (Control Signal 2) that starts and stops the drive when the control place is I/O A (REV).

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

Default programming A.2.

### 10.149 (ID 405) External Fault Close

Location in the menu:

- **P2.2.7.11** (Multi-purpose Control Application)
- **P2.2.6.4** (Pump and Fan Control Application)

Use this parameter to select the digital input signal that activates an external fault.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

Contact closed: Fault (F51) is shown and motor stopped.

## 10.150 (ID 406) External Fault Open

Location in the menu:

- **P2.2.7.12** (Multi-purpose Control Application)
- **P2.2.6.5** (Pump and Fan Control Application)

Use this parameter to select the digital input signal that activates an external fault.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

Contact open: Fault (F51) is shown and motor stopped.

## 10.151 (ID 407) Run Enable

Location in the menu:

- **P2.2.7.3** (Multi-purpose Control Application)
- **P2.2.6.6** (Pump and Fan Control Application)

Use this parameter to select the digital input signal that sets the drive to Ready state.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

When the contact is OPEN, the start of the motor is disabled.

When the contact is CLOSED, the start of the motor is enabled.

To stop, the drive obeys the value of parameter *ID 506*. The follower drive will always coast to stop.

## 10.152 (ID 408) Acceleration/Deceleration Time Selection

Location in the menu:

- **P2.2.7.13** (Multi-purpose Control Application)
- **P2.2.6.7** (Pump and Fan Control Application)

Use this parameter to select the digital input signal that selects the acceleration/ deceleration time 1 or 2.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

When the contact is OPEN, the Acceleration/Deceleration time 1 is selected.

When the contact is CLOSED, the Acceleration/Deceleration time 2 is selected.

Set Acceleration/Deceleration times with parameters *ID 103* and *ID 104* and the alternative ramp times with *ID 502* and *ID 503*.

### 10.153 (ID 409) I/O Terminal Control

Location in the menu:

- **P2.2.7.18** (Multi-purpose Control Application)
- **P2.2.6.8** (Pump and Fan Control Application)

Use this parameter to select the digital input signal that switches the control place and the frequency reference source to I/O terminal (from any control place).

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

Switch closed: Force control place to I/O terminal.

This input has priority over parameters *ID 410* and *ID 411*.

### 10.154 (ID 410) Keypad Control

Location in the menu:

- **P2.2.7.19** (Multi-purpose Control Application)
- **P2.2.6.9** (Pump and Fan Control Application)

Use this parameter to select the digital input signal that switches the control place and the frequency reference source to Keypad (from any control place).

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

Switch closed: Force control place to keypad.

This input has priority over parameter *ID 411* but preceded in priority by *ID 409*.

### 10.155 (ID 411) Control from Fieldbus

Location in the menu:

- **P2.2.7.20** (Multi-purpose Control Application)
- **P2.2.6.10** (Pump and Fan Control Application)

Use this parameter to select the digital input signal that switches the control place and the frequency reference source to Fieldbus (from I/O A, I/O B or Local control).

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

Contact closed: Force control place to fieldbus

This input is preceded in priority by parameters *ID 409* and *ID 410*.

When the control place is forced to change the values of Start/Stop, Direction, and Reference valid in the respective control place are used.

The value of parameter *ID 125 (Keypad Control Place)* does not change.

When the input opens, the control place is selected according to keypad control parameter *ID 125*.

### 10.156 (ID 412) Reverse

Location in the menu:

- **P2.2.7.4** (Multi-purpose Control Application)
- **P2.2.6.11** (Pump and Fan Control Application)

Use this parameter to select the digital input signal that changes the direction when Start signal 2 is used for other purposes.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

Contact open: Direction forward

Contact closed: Direction reverse

This command is active when *Start signal 2 (ID 404)* is used for other purposes.

### 10.157 (ID 413) Jogging Speed

Location in the menu:

- **P2.2.7.16** (Multi-purpose Control Application)
- **P2.2.6.12** (Pump and Fan Control Application)

Use this parameter to select the digital input signal that selects jogging speed for the frequency reference.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

Contact closed: Jogging speed selected for frequency reference

See parameter *ID 124*.

Default programming: A.4.

### 10.158 (ID 414) Fault Reset

Location in the menu:

- **P2.2.7.10** (Multi-purpose Control Application)
- **P2.2.6.13** (Pump and Fan Control Application)

Use this parameter to select the digital input signal that resets all active faults.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

CLOSED = Resets all active faults. Rising edge resets the faults.



### 10.159 (ID 415) Acc/Dec Prohibit

Location in the menu:

- **P2.2.7.14** (Multi-purpose Control Application)
- **P2.2.6.14** (Pump and Fan Control Application)

Use this parameter to select the digital input signal that prevents the acceleration and the deceleration of the drive. No acceleration or deceleration is possible until the contact is open.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

### 10.160 (ID 416) DC-Braking

Location in the menu:

- **P2.2.7.15** (Multi-purpose Control Application)
- **P2.2.6.15** (Pump and Fan Control Application)

Use this parameter to select the digital input signal that starts DC-braking in the STOP mode.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

Contact closed: In STOP mode, the DC-braking operates until the contact is opened.

See *ID 1080*.

### 10.161 (ID 417) Motor Potentiometer Down

Location in the menu:

- **P2.2.7.8** (Multi-purpose Control Application)
- **P2.2.7.16** (Pump and Fan Control Application)

Use this parameter to decrease the output frequency with a digital input signal. The motor potentiometer reference DECREASES until the contact is open.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

### 10.162 (ID 418) Motor Potentiometer Up

Location in the menu:

- **P2.2.7.9** (Multi-purpose Control Application)
- **P2.2.7.17** (Pump and Fan Control Application)

Use this parameter to increase the output frequency with a digital input signal. The motor potentiometer reference INCREASES until the contact is open.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

### 10.163 (ID 419) Preset Speed 1

Location in the menu: **P2.2.7.5** (Multi-purpose Control Application)

Use this parameter to select the digital input signal that is used as a selector for the preset frequencies.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

### 10.164 (ID 420) Preset Speed 2

Location in the menu: **P2.2.7.6** (Multi-purpose Control Application)

Use this parameter to select the digital input signal that is used as a selector for the preset frequencies.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

### 10.165 (ID 421) Preset Speed 3

Location in the menu: **P2.2.7.7** (Multi-purpose Control Application)

Use this parameter to select the digital input signal that is used as a selector for the preset frequencies.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

### 10.166 (ID 422) AI1/AI2 Selection

Location in the menu: **P2.2.7.17** (Multi-purpose Control Application)

Use this parameter to select the analog input signal that is used for the frequency reference.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

With value 14 selected for parameter *ID 117*, this parameter allows either AI1 or AI2 signal for the frequency reference.

### 10.167 (ID 423) Start A Signal

Location in the menu: **P2.2.6.1** (Pump and Fan Control Application)

Use this parameter to select the digital input signal that starts and stops the drive when the control place is I/O A.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

Default programming: A.1

### 10.168 (ID 424) Start B Signal

Location in the menu: **P2.2.6.2** (Pump and Fan Control Application)

Use this parameter to select the digital input signal that starts and stops the drive when the control place is I/O B.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

Default programming: A.4

### 10.169 (ID 425) Control Place A/B Selection

Location in the menu: **P2.2.6.3** (Pump and Fan Control Application)

Use this parameter to select the digital input signal that selects the control place I/O A or I/O B.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

Contact open: Control place A

Contact closed: Control place B

Default programming: A.6

### 10.170 (ID 426) Autochange 1 Interlock

Location in the menu: **P2.2.7.18** (Pump and Fan Control Application)

Use this parameter to select the digital input signal that is used as interlock signal for the Multi-Pump system.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

Contact closed: Interlock of autochange drive 1 or auxiliary drive 1 activated.

Default programming: A.2.

### 10.171 (ID 427) Autochange 2 Interlock

Location in the menu: **P2.2.7.19** (Pump and Fan Control Application)

Use this parameter to select the digital input signal that is used as interlock signal for the Multi-Pump system.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

Contact closed: Interlock of autochange drive 2 or auxiliary drive 2 activated.

Default programming: A.3.

### 10.172 (ID 428) Autochange 3 Interlock

Location in the menu: **P2.2.7.20** (Pump and Fan Control Application)

Use this parameter to select the digital input signal that is used as interlock signal for the Multi-Pump system.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

Contact closed: Interlock of autochange drive 3 or auxiliary drive 3 activated.

### 10.173 (ID 429) Autochange 4 Interlock

Location in the menu: **P2.2.7.21** (Pump and Fan Control Application)

Use this parameter to select the digital input signal that is used as interlock signal for the Multi-Pump system.

Contact closed: Interlock of autochange drive 4 or auxiliary drive 4 activated.

### 10.174 (ID 430) Autochange 5 Interlock

Location in the menu: **P2.2.7.22** (Pump and Fan Control Application)

Use this parameter to select the digital input signal that is used as interlock signal for the Multi-Pump system.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

Contact closed: Interlock of autochange drive 5 activated.

### 10.175 (ID 431) PID Reference 2

Location in the menu: **P2.2.7.23** (Pump and Fan Control Application)

Use this parameter to select the source of the PID setpoint signal.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

Contact open: PID controller reference selected with parameter *ID 332*.

Contact closed: PID controller keypad reference 2 selected with parameter *ID 371*.

### 10.176 (ID 432) Ready

Location in the menu:

- **P2.3.3.1** (Multi-purpose Control Application)
- **P2.3.1.1** (Pump and Fan Control Application)

Use this parameter to select a digital output for the *Ready* status.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

### 10.177 (ID 433) Run

Location in the menu:

- **P2.3.3.2** (Multi-purpose Control Application)
- **P2.3.1.2** (Pump and Fan Control Application)

Use this parameter to select a digital output for the *Run* status.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

### 10.178 (ID 434) Fault

Location in the menu:

- P2.3.3.3 (Multi-purpose Control Application)
- P2.3.1.3 (Pump and Fan Control Application)

Use this parameter to select a digital output for the *Fault* status.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

### 10.179 (ID 435) Inverted Fault

Location in the menu:

- P2.3.3.4 (Multi-purpose Control Application)
- P2.3.1.4 (Pump and Fan Control Application)

Use this parameter to select a digital output for the fault inverted status.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

### 10.180 (ID 436) Warning

Location in the menu:

- P2.3.3.5 (Multi-purpose Control Application)
- P2.3.1.5 (Pump and Fan Control Application)

Use this parameter to select a digital output for the *Warning* status.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

### 10.181 (ID 437) External Fault or Warning

Location in the menu:

- P2.3.1.6 (Pump and Fan Control Application)
- P2.3.3.6 (Multi-Purpose Control Application)

Use this parameter to select a digital output for the external fault status.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

Fault or warning depending on parameter *ID 701*.

### 10.182 (ID 438) Reference Fault or Warning

Location in the menu:

- P2.3.1.7 (Pump and Fan Control Application)
- P2.3.3.7 (Multi-Purpose Control Application)

Use this parameter to select a digital output for the AI reference fault status.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

Fault or warning depending on parameter *ID 700*.

### 10.183 (ID 439) Drive Overtemperature Warning

Location in the menu:

- **P2.3.1.8** (Pump and Fan Control Application)
- **P2.3.3.8** (Multi-Purpose Control Application)

Use this parameter to select a digital output for the overtemperature fault status.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

The heat sink temperature exceeds the warning limit.

### 10.184 (ID 440) Reverse

Location in the menu:

- **P2.3.1.9** (Pump and Fan Control Application)
- **P2.3.3.9** (Multi-Purpose Control Application)

Use this parameter to select a digital output for the reverse status.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

### 10.185 (ID 441) Unrequested Direction

Location in the menu:

- **P2.3.1.10** (Pump and Fan Control Application)
- **P2.3.3.10** (Multi-Purpose Control Application)

Use this parameter to select a digital output for the direction difference status.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

Motor rotation direction is different from the requested one.

### 10.186 (ID 442) At Speed

Location in the menu:

- **P2.3.1.11** (Pump and Fan Control Application)
- **P2.3.3.11** (Multi-Purpose Control Application)

Use this parameter to select a digital output for the motor running at reference speed status.

The output frequency has reached the set reference.

Hysteresis is equal to motor nominal slip with induction motors and to 1.00 Hz with PMS motors.

### 10.187 (ID 443) Jogging Speed

Location in the menu:

- **P2.3.1.12** (Pump and Fan Control Application)
- **P2.3.3.12** (Multi-Purpose Control Application)

Use this parameter to select a digital output for the jogging speed status.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

### 10.188 (ID 444) I/O Control Place Active

Location in the menu:

- **P2.3.1.13** (Pump and Fan Control Application)
- **P2.3.3.13** (Multi-Purpose Control Application)

Use this parameter to select a digital output for the external control place status.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

### 10.189 (ID 445) External Brake Control

Location in the menu:

- **P2.3.1.14** (Pump and Fan Control Application)
- **P2.3.3.14** (Multi-Purpose Control Application)

Use this parameter to select a digital output for the external brake control status.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

See [10.519 External Brake Control with Additional Limits \(IDs 315, 316, 346–349, 352, 353\)](#) for details.

Example: RO1 on OPTA2 board:

- Brake function ON: Terminals 22–23 are closed (relay is energized).
- Brake function OFF: Terminals 22–23 are open (relay not energized).

When power from control board is removed, the terminals 22–23 open.

When using the Master Follower function, the follower drive opens the brake at the same time as the Master does even if the Follower's conditions for brake opening have not been met.

### 10.190 (ID 446) External Brake Control, Inverted

Location in the menu:

- **P2.3.1.15** (Pump and Fan Control Application)
- **P2.3.3.15** (Multi-Purpose Control Application)

Use this parameter to select a digital output for the external brake control inverted status.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

See [10.519 External Brake Control with Additional Limits \(IDs 315, 316, 346–349, 352, 353\)](#) for details.

Example: RO1 on OPTA2 board:

- Brake function ON: Terminals 22–23 are open (relay not energized).
- Brake function OFF: Terminals 22–23 are closed (relay is energized).

When using the Master Follower function, the follower drive opens the brake at the same time as the Master does even if the Follower's conditions for brake opening have not been met.

### 10.191 (ID 447) Output Frequency Limit 1 Supervision

Location in the menu:

- **P2.3.1.16** (Pump and Fan Control Application)
- **P2.3.3.16** (Multi-Purpose Control Application)

Use this parameter to select a digital output for the frequency output supervision 1 status.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

The output frequency goes outside the set supervision low limit/high limit (see parameters *ID 315* and *ID 316*).

### 10.192 (ID 448) Output Frequency Limit 2 Supervision

Location in the menu:

- **P2.3.1.17** (Pump and Fan Control Application)
- **P2.3.3.17** (Multi-Purpose Control Application)

Use this parameter to select a digital output for the frequency output supervision 2 status.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

The output frequency goes outside the set supervision low limit/high limit (see parameters *ID 346* and *ID 347*).

### 10.193 (ID 449) Reference Limit Supervision

Location in the menu:

- **P2.3.1.18** (Pump and Fan Control Application)
- **P2.3.3.18** (Multi-Purpose Control Application)

Use this parameter to select a digital output for the reference limit supervision status.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).



Active reference goes beyond the set supervision low limit/high limit (see parameters *ID 350* and *ID 351*).

### 10.194 (ID 450) Temperature Limit Supervision

Location in the menu:

- **P2.3.1.19** (Pump and Fan Control Application)
- **P2.3.3.19** (Multi-Purpose Control Application)

Use this parameter to select a digital output for the temperature limit supervision status.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

The AC drive heat sink temperature goes beyond the set supervision limits (see parameters *ID 354* and *ID 355*).

### 10.195 (ID 451) Torque Limit Supervision

Location in the menu:

- **P2.3.1.20** (Pump and Fan Control Application)
- **P2.3.3.20** (Multi-Purpose Control Application)

Use this parameter to select a digital output for the torque limit supervision status.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

The motor torque goes beyond the set supervision limits (see parameters *ID 348* and *ID 349*).

### 10.196 (ID 452) Thermistor Fault or Warning

Location in the menu:

- **P2.3.1.21** (Pump and Fan Control Application)
- **P2.3.3.21** (Multi-Purpose Control Application)

Use this parameter to select a digital output for the motor thermal fault status.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

Motor thermistor initiates an overtemperature signal which can be led to a digital output.

This function requires an AC drive equipped with a thermistor input.

### 10.197 (ID 453) Analog Input Supervision

Location in the menu: **P2.3.3.22** (Multi-Purpose Control Application)

Use this parameter to select a digital output for the analog input supervision status.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

The selected analog input signal goes beyond the set supervision limits (see parameters *ID 372*, *ID 373*, and *ID 374*).

## 10.198 (ID 454) Motor Regulator Activation

Location in the menu:

- **P2.3.1.23** (Pump and Fan Control Application)
- **P2.3.3.23** (Multi-Purpose Control Application)

Use this parameter to select a digital output for the motor regulator status.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

One of the limit regulators (current limit, torque limit) has been activated.

## 10.199 (ID 455) Fieldbus Digital Input 1

Location in the menu:

- **P2.3.1.24** (Pump and Fan Control Application)
- **P2.3.3.24** (Multi-Purpose Control Application)

Use this parameter to select a digital output for the FBFixedControlWord B3 status.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

See the fieldbus manual for details. See also *ID 169* and *ID 170*.

## 10.200 (ID 456) Fieldbus Digital Input 2

Location in the menu:

- **P2.3.1.25** (Pump and Fan Control Application)
- **P2.3.3.25** (Multi-Purpose Control Application)

Use this parameter to select a digital output for the FBFixedControlWord B4 status.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

See the fieldbus manual for details. See also *ID 169* and *ID 170*.

## 10.201 (ID 457) Fieldbus Digital Input 3

Location in the menu:

- **P2.3.1.26** (Pump and Fan Control Application)
- **P2.3.3.26** (Multi-Purpose Control Application)

Use this parameter to select a digital output for the FBFixedControlWord B5 status.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

See the fieldbus manual for details. See also *ID 169* and *ID 170*.

### 10.202 (ID 458) Autochange 1/Auxiliary Drive 1 Control

Location in the menu: P2.3.1.27 (Pump and Fan Control Application)

Use this parameter to select a digital output for the autochange/auxiliary drive status.

Default programming: B.1

### 10.203 (ID 459) Autochange 2/Auxiliary Drive 2 Control

Location in the menu: P2.3.1.28 (Pump and Fan Control Application)

Use this parameter to select a digital output for the autochange/auxiliary drive status.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

Control signal for autochange/auxiliary drive 2.

Default programming: B.2

### 10.204 (ID 460) Autochange 3/Auxiliary Drive 3 Control

Location in the menu: P2.3.1.29 (Pump and Fan Control Application)

Use this parameter to select a digital output for the autochange/auxiliary drive status.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

Control signal for autochange/auxiliary drive 3. If three (or more) auxiliary drives are used, we recommend connecting number 3, too, to a relay output. Since the OPTA2 board only has two relay outputs, it is recommended to purchase an I/O expander board with extra relay outputs (for example, VACON® OPTB5).

### 10.205 (ID 461) Autochange 4/Auxiliary Drive 4 Control

Location in the menu: P2.3.1.30 (Pump and Fan Control Application)

Use this parameter to select a digital output for the autochange/auxiliary drive status.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

Control signal for autochange/auxiliary drive 4. If three (or more) auxiliary drives are used, we recommend connecting number 3 and 4, too, to a relay output. Since the OPTA2 board only has two relay outputs, it is recommended to purchase an I/O expander board with extra relay outputs (for example, VACON® OPTB5).

### 10.206 (ID 462) Autochange 5 Control

Location in the menu: P2.3.1.31 (Pump and Fan Control Application)

Use this parameter to select a digital output for the autochange status.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

Control signal for autochange drive 5.

### 10.207 (ID 463) Analog Input Supervision Limit

Location in the menu: **P2.3.1.22** (Pump and Fan Control Application)

Use this parameter to select a digital output for the analog input supervision status.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

The selected analog input signal goes beyond the set supervision limits (see parameters *ID 372*, *ID 373*, and *ID 374*).

### 10.208 (ID 464) Analog Output 1 Signal Selection

Location in the menu:

- **P2.3.1** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application)
- **P2.3.5.1** (Multi-purpose Control Application)
- **P2.3.3.1** (Pump and Fan Control Application)

Use this parameter to connect the analog output signal 1 to the selected analog output.

The signal selection is done with "Terminal to Function" (TTF) programming. See [10.525 "Terminal to Function" \(TTF\) Programming Principle](#).

### 10.209 (ID 471) Analog Output 2 Signal Selection

Location in the menu:

- **P2.3.12** (Standard Application)
- **P2.3.22** (Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application)
- **P2.3.6.1** (Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to connect the analog output signal 2 to the selected analog output.

The signal selection is done with "Terminal to Function" (TTF) programming. See [10.525 "Terminal to Function" \(TTF\) Programming Principle](#).

### 10.210 (ID 472) Analog Output 2 Function

Location in the menu:

- **P2.3.13** (Standard Application)
- **P2.3.23** (Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application)
- **P2.3.6.2** (Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to select the function for the analog output 2 signal.

### 10.211 (ID 473) Analog Output 2 Filter Time

Location in the menu:

- **P2.3.14** (Standard Application)
- **P2.3.24** (Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application)
- **P2.3.6.3** (Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to set the filtering time of the analog output 2 signal.

### 10.212 (ID 474) Analog Output 2 Inversion

Location in the menu:

- **P2.3.15** (Standard Application)
- **P2.3.25** (Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application)
- **P2.3.6.4** (Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to invert the analog output 2 signal.

See [10.69 \(ID 309\) Analog Output 1 Inversion](#).

### 10.213 (ID 475) Analog Output 2 Minimum

Location in the menu:

- **P2.3.16** (Standard Application)
- **P2.3.26** (Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application)
- **P2.3.6.5** (Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to set the minimum value of the analog output 2 signal.

See [10.70 \(ID 310\) Analog Output 1 Minimum](#).

### 10.214 (ID 476) Analog Output 2 Scale

Location in the menu:

- **P2.3.17** (Standard Application)
- **P2.3.27** (Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application)
- **P2.3.6.6** (Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to set the scaling factor for the analog 2 output.

See [10.71 \(ID 311\) Analog Output 1 Scale](#).

### 10.215 (ID 477) Analog Output 2 Offset

Location in the menu: **P2.3.3.7**

Use this parameter to add offset to the analog output 2.

Add -100.0% to 100.0% to the analog output signal.

See [10.131 \(ID 375\) Analog Output 1 Offset](#).

## 10.216 (ID 478) Analog Output 3 Signal Selection

Location in the menu:

- **P2.3.7.1** (Multi-Purpose Control Application)
- **P2.3.5.1** ( Pump and Fan Control Application)

Use this parameter to connect the analog output signal 3 to the selected analog output.

The signal selection is done with "Terminal to Function" (TTF) programming. See [10.525 "Terminal to Function" \(TTF\) Programming Principle](#).

## 10.217 (ID 479) Analog Output 3 Function

Location in the menu:

- **P2.3.7.2** (Multi-Purpose Control Application)
- **P2.3.5.2** (Pump and Fan Control Application)
  
- 0 = Not used (4 mA/2 V)
- 1 = DCCurrent± (-100%...+100% DC-link current)

## 10.218 (ID 480) Analog Output 3 Filter Time

Location in the menu:

- **P2.3.7.3** (Multi-Purpose Control Application)
- **P2.3.5.3** (Pump and Fan Control Application)

Use this parameter to set the filtering time of the analog output 3 signal.

Setting this parameter value to 0 deactivates filtering.

See [10.68 \(ID 308\) Analog Output 1 Filter Time](#).

## 10.219 (ID 481) Analog Output 3 Inversion

Location in the menu:

- **P2.3.7.4** (Multi-Purpose Control Application)
- **P2.3.5.4** (Pump and Fan Control Application)

Use this parameter to invert the analog output 3 signal.

See [10.69 \(ID 309\) Analog Output 1 Inversion](#).

## 10.220 (ID 482) Analog Output 3 Minimum

Location in the menu:

- P2.3.7.5 (Multi-Purpose Control Application)
- P2.3.5.5 ( Pump and Fan Control Application)

Use this parameter to set the minimum value of the analog output 3 signal.

The parameter defines the signal minimum to either 0 mA or 4 mA (living zero).

See [10.70 \(ID 310\) Analog Output 1 Minimum](#).

## 10.221 (ID 483) Analog Output 3 Scale

Location in the menu:

- P2.3.7.6 (Multi-Purpose Control Application)
- P2.3.5.6 (Pump and Fan Control Application)

Use this parameter to set the scaling factor for the analog 3 output.

Value 200% will double the output.

See [10.71 \(ID 311\) Analog Output 1 Scale](#).

## 10.222 (ID 484) Analog Output 3 Offset

Location in the menu:

- P2.3.7.2 (Multi-Purpose Control Application)
- P2.3.5.2 (Pump and Fan Control Application)

Use this parameter to add offset to the analog output 3.

Add -100.0% to 100.0% to the analog output signal.

See [10.131 \(ID 375\) Analog Output 1 Offset](#).

## 10.223 (ID 485) Scaling of Motoring Torque Limit

Location in the menu: P2.2.6.5 (Multi-purpose Control Application)

Use this parameter to select the signal that adjusts the maximum motor torque limit.

For selection 5 "Fieldbus (FBProcessDataIN2)", see [10.523 Fieldbus Control Parameters \(IDs 850–859\)](#).

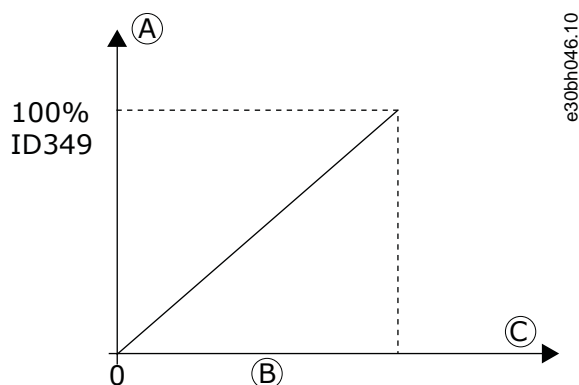


Illustration 66: Scaling of Motoring Torque Limit

### 10.224 (ID 486) Digital Output 1 Signal Selection

Location in the menu: P2.3.1.1 (Multi-Purpose Control Application)

Use this parameter to connect the digital output signal to the digital output of your selection.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

Use Control options, parameter ID 1084 to invert the Digital output function.

### 10.225 (ID 487) Digital Output 1 On-Delay

Location in the menu: P2.3.1.3 (Multi-Purpose Control Application)

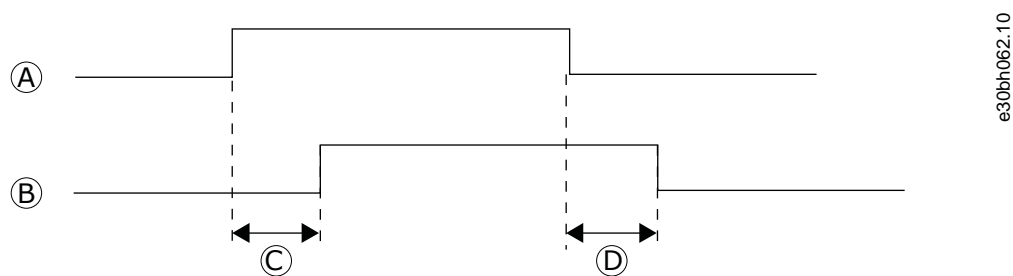
Use this parameter to set the ON delay for the digital output.

See [illustration 67](#).

### 10.226 (ID 488) Digital Output 1 Off-Delay

Location in the menu: P2.3.1.4 (Multi-Purpose Control Application)

Use this parameter to set the OFF delay for the digital output.



A Signal programmed to digital output	B DO1 or DO2 output
---------------------------------------	---------------------



C ON-delay	D OFF-delay
------------	-------------

Illustration 67: Digital Outputs 1 and 2, On- and Off-Delays

### 10.227 (ID 489) Digital Output 2 Signal Selection

Location in the menu: **P2.3.2.1** (Multi-Purpose Control Application)

Use this parameter to connect the digital output signal to the digital output of your selection.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

See [10.224 \(ID 486\) Digital Output 1 Signal Selection](#).

### 10.228 (ID 490) Digital Output 2 Function

Location in the menu: **P2.3.2.2** (Multi-Purpose Control Application)

Use this parameter to select the function for the digital output signal.

See [10.72 \(ID 312\) Digital Output Function](#).

### 10.229 (ID 491) Digital Output 2 On-Delay

Location in the menu: **P2.3.2.3** (Multi-Purpose Control Application)

Use this parameter to set the ON delay for the digital output.

See [10.225 \(ID 487\) Digital Output 1 On-Delay](#).

### 10.230 (ID 492) Digital Output 2 Off-Delay

Location in the menu: **P2.3.2.4** (Multi-Purpose Control Application)

Use this parameter to set the OFF delay for the digital output.

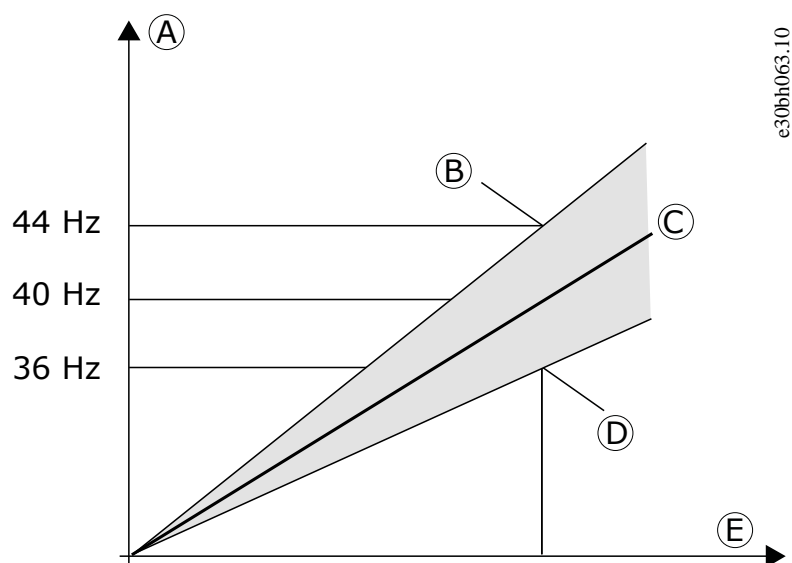
See [10.226 \(ID 488\) Digital Output 1 Off-Delay](#).

### 10.231 (ID 493) Adjust Input

Location in the menu: **P2.2.1.4** (Multi-Purpose Control Application)

Use this parameter to select the signal that adjusts the frequency reference of the motor.

For selection 5 "Signal from fieldbus (FBProcessDataIN), see [10.523 Fieldbus Control Parameters \(IDs 850–859\)](#) and parameter group **G2.9**.



A	Frequency, adjusted	B	Adjust maximum, ID 495 = 10%
C	Adjust 0%	D	Adjust minimum, ID 494 = 10%
E	AI		

Illustration 68: An Example of Adjust Input

### 10.232 (ID 494) Adjust Minimum

Location in the menu: P2.2.1.5 (Multi-Purpose Control Application)

Use this parameter to set extra scaling to the adjusted frequency reference.

See [illustration 68](#).

The adjustment is made to the basic reference signal.

### 10.233 (ID 495) Adjust Maximum

Location in the menu: P2.2.1.6 (Multi-Purpose Control Application)

Use this parameter to set extra scaling to the adjusted frequency reference.

See [illustration 68](#).

The adjustment is made to the basic reference signal.

### 10.234 (ID 496) Parameter Set 1 / Set 2 Selection

Location in the menu: P2.2.7.21 (Multi-Purpose Control Application)

Use this parameter to set the digital input that selects the parameter set to be used.

TTF programming method must be applied to this parameter (see [10.525 "Terminal to Function" \(TTF\) Programming Principle](#)).

This parameter defines the digital input, which can be used to select between Parameter Set 1 and Set 2. The input for this function can be selected from any slot. The procedure of selecting between the sets is explained in the User Manual of the product.

Digital input = FALSE: Set 1 is loaded as the active set.

Digital input = TRUE: Set 2 is loaded as the active set.

The parameter values are stored only when selecting *Store Set 1* or *Store Set 2* in *System* menu, in *S6.3.1, Parameter sets* or from VACON® NCDriver: Drive > Parameter Sets.

### 10.235 (ID 498) Start Pulse Memory

Location in the menu: **P2.2.24** (Local/Remote Control Application)

Use this parameter to select if the *RUN* status is copied when the control place is changed between A and B.

In order for this parameter to affect, parameters *ID 300* and *ID 363* must have been set the value 3.

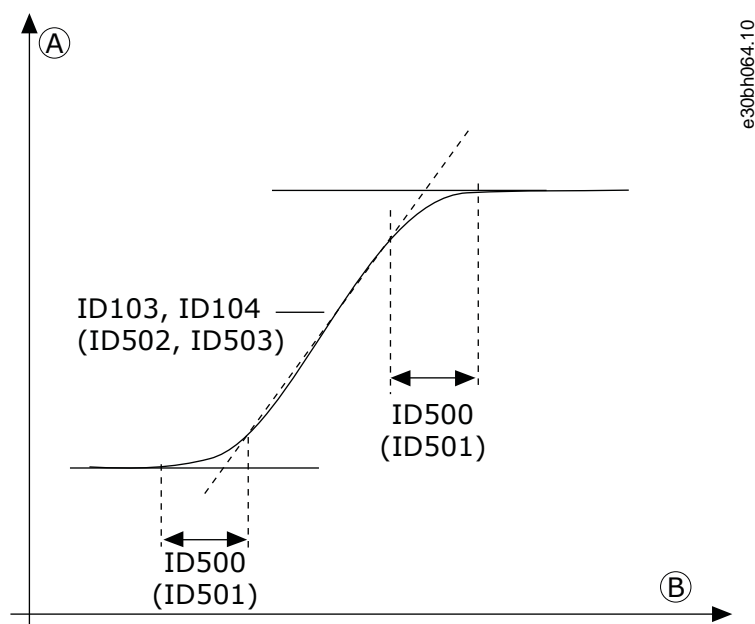
### 10.236 (ID 500) Acceleration/Deceleration Ramp 1 Shape

Location in the menu: **P2.4.1** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to make the start and the end of the acceleration and deceleration ramps smoother.

Setting the value to 0.0% creates a linear ramp shape. The acceleration and deceleration act immediately to the changes in the reference signal.

Setting the value between 1.0% and 100.0% creates an S-shaped acceleration or deceleration ramp. Use this function to reduce mechanical erosion of the parts and current spikes when the reference changes. To modify the acceleration time, use parameters *ID 103 / ID 104 (ID 502 / ID 503)*.



A Frequency	B Time
-------------	--------

Illustration 69: Acceleration/Deceleration (S-Shaped)

### 10.237 (ID 501) Acceleration/Deceleration Ramp 2 Shape

Location in the menu: **P2.4.1** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to make the start and the end of the acceleration and deceleration ramps smoother.

See [10.236 \(ID 500\) Acceleration/Deceleration Ramp 1 Shape](#).

### 10.238 (ID 502) Acceleration Time 2

Location in the menu: **P2.4.3** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to set the time that is necessary for the output frequency to increase from zero frequency to maximum frequency.

These values correspond to the time required for the output frequency to accelerate from the zero frequency to the set maximum frequency (parameter *ID 102*). These parameters give the possibility to set two different acceleration/deceleration time sets for one application. The active set can be selected with the programmable signal DIN 3 (parameter *ID 301*).

### 10.239 (ID 503) Deceleration Time 2

Location in the menu: **P2.4.4** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to set the time that is necessary for the output frequency to decrease from maximum frequency to zero frequency.

See [10.238 \(ID 502\) Acceleration Time 2](#).

## 10.240 (ID 504) Brake Chopper

Location in the menu: **P2.4.5** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to select the brake chopper mode.

Selection number	Selection name	Description
0	No brake chopper used	
1	Brake chopper in use and tested when running.	Can be tested also in READY state.
2	External brake chopper (no testing)	
3	Used and tested in READY state and when running	
4	Used when running (no testing)	

When the AC drive is decelerating the motor, the inertia of the motor and the load are fed into an external brake resistor. It enables the AC drive to decelerate the load with a torque equal to that of acceleration (as long as the correct brake resistor has been selected).

The brake chopper test mode generates a pulse to the resistor every second. If the pulse feedback is wrong (resistor or brake chopper is missing), fault F12 is generated.

See separate Brake resistor installation manual.

## 10.241 (ID 505) Start Function

Location in the menu: **P2.4.6** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to select the type of the start function.

Selection number	Selection name	Description
0	Ramp	The AC drive starts from 0 Hz and accelerates to the set reference frequency within the set acceleration time. (Load inertia or starting friction can cause prolonged acceleration times).
1	Flying start	The AC drive detects the actual speed of the motor and accelerates from that speed to frequency reference.  Use this mode if the motor is coasting when the start command is given. With the flying start, it is possible to start the motor from actual speed without forcing the speed to zero before ramping to reference.
2	Conditional flying start	With this mode, it is possible to disconnect and connect the motor from the AC drive even when the Start command is active. On reconnecting the motor, the drive operates as described in selection 1.

## 10.242 (ID 506) Stop Function

Location in the menu: **P2.4.7** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to select the type of the stop function.

Selection number	Selection name	Description
0	Coasting	The motor coasts to a halt without any control from the AC drive, after the Stop command.
1	Ramp	After the Stop command, the speed of the motor is decelerated according to the set deceleration parameters to zero speed.  If the regenerated energy is high, it can be necessary to use an external brake resistor to stop within the set deceleration time.
2	Normal stop: Ramp/ Run Enable stop: coasting	After the Stop command, the speed of the motor is decelerated according to the set deceleration parameters. However, when Run Enable is selected, the motor coasts to a halt without any control from the AC drive.
3	Normal stop: Coasting/ Run Enable stop: ramping	The motor coasts to a halt without any control from the AC drive. However, when Run Enable signal is selected, the speed of the motor is decelerated according to the set deceleration parameters. If the regenerated energy is high, it can be necessary to use an external brake resistor for faster deceleration.

## 10.243 (ID 507) DC-Braking Current

Location in the menu: **P2.4.8** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to set the current that is fed into the motor during DC-braking.

DC brake in stop state only uses a tenth of this parameter value.

This parameter is used together with parameter *ID 516* to decrease the time before the motor is able to produce maximum torque at start-up.

## 10.244 (ID 508) DC-Braking Time at Stop

Location in the menu: **P2.4.9** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to set the braking is ON or OFF and to give the braking time when the motor stops.

The function of the DC brake depends on the stop function, parameter ID 506.

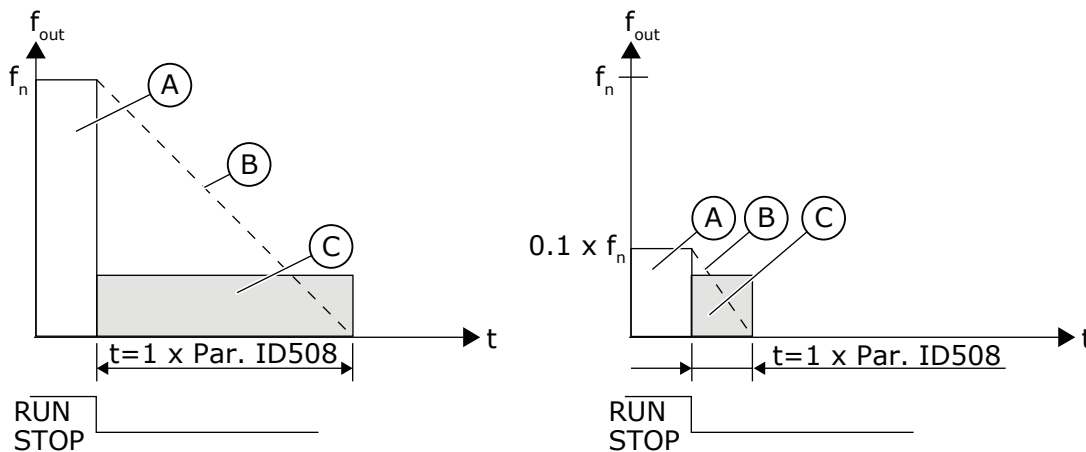
- 0 = DC brake is not used.
- >0 = DC brake is in use and its function depends on the Stop function, (parameter ID 506). The DC-braking time is determined with this parameter.

**Parameter ID 506 = 0 (Stop Function = Coasting)**

After the stop command, the motor coasts to a stop without control of the AC drive.

With DC-injection, the motor can be electrically stopped in the shortest possible time, without using an optional external brake resistor.

The braking time is scaled according to the frequency when the DC-braking starts. If the frequency is  $\geq$  the nominal frequency of the motor, the set value of parameter *ID 508* determines the braking time. When the frequency is  $\leq 10\%$  of the nominal, the braking time is 10% of the set value of parameter *ID 508*.



e30bh095.10

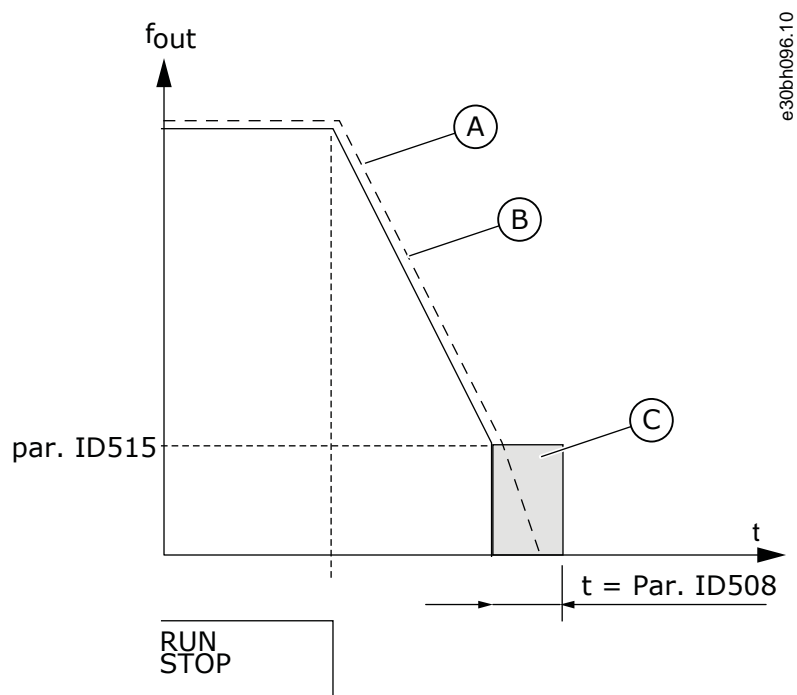
A Output frequency	B Motor speed
C DC-braking ON	

**Illustration 70: DC-Braking Time when Stop Mode = Coasting**

**Parameter ID 506 = 1 (Stop Function = Ramp)**

After the Stop command, the speed of the motor is reduced according to the set deceleration parameters, as fast as possible, to the speed defined with parameter *ID 515*, where the DC-braking starts.

The braking time is defined with parameter *ID 508*. If high inertia exists, it is recommended to use an external brake resistor for faster deceleration.



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A Motor speed	B Output frequency
C DC-braking	

Illustration 71: DC-Braking Time when Stop Mode = Ramp

### 10.245 (ID 509) Prohibit Frequency Range 1 Low Limit

Location in the menu: P2.5.1 (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to prevent the drive operating on the prohibited frequencies.

In some processes, it can be necessary to avoid some frequencies because they cause mechanical resonance.

With this parameter, it is possible to set limits for the "skip frequency" region.

### 10.246 (ID 510) Prohibit Frequency Range 1 High Limit

Location in the menu: P2.5.2 (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to prevent the drive operating on the prohibited frequencies. In some processes, it can be necessary to avoid some frequencies because they cause mechanical resonance.

With this parameter, it is possible to set limits for the "skip frequency" region.



### 10.247 (ID 511) Prohibit Frequency Range 2 Low Limit

Location in the menu: **P3.7.3**

Location in the menu: **P2.5.3** (Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to prevent the drive operating on the prohibited frequencies. In some processes, it can be necessary to avoid some frequencies because they cause mechanical resonance.

With this parameter, it is possible to set limits for the "skip frequency" region.

### 10.248 (ID 512) Prohibit Frequency Range 2 High Limit

Location in the menu: **P2.5.4** (Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to prevent the drive operating on the prohibited frequencies. In some processes, it can be necessary to avoid some frequencies because they cause mechanical resonance.

With this parameter, it is possible to set limits for the "skip frequency" region.

### 10.249 (ID 513) Prohibit Frequency Range 3 Low Limit

Location in the menu: **P2.5.5** (Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to prevent the drive operating on the prohibited frequencies. In some processes, it can be necessary to avoid some frequencies because they cause mechanical resonance.

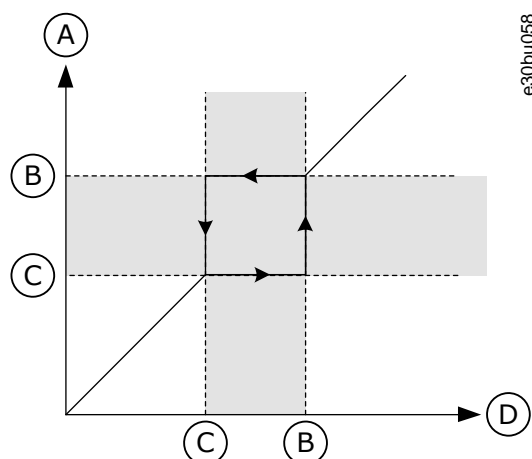
With this parameter, it is possible to set limits for the "skip frequency" region.

### 10.250 (ID 514) Prohibit Frequency Range 3 High Limit

Location in the menu: **P2.5.6** (Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to prevent the drive operating on the prohibited frequencies. In some processes, it can be necessary to avoid some frequencies because they cause mechanical resonance.

With this parameter, it is possible to set limits for the "skip frequency" region.



A Actual Reference	B High Limit
C Low Limit	D Requested Reference

Illustration 72: The prohibited frequencies

### 10.251 (ID 515) Frequency to Start DC Braking at Ramp Stop

Location in the menu: **P2.4.10** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to set the output frequency at which the DC-braking starts.

See [illustration 72](#).

### 10.252 (ID 516) Start Magnetizing Time

Location in the menu: **P2.4.11** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to set the time during which the DC current is fed to the motor before the acceleration starts.

DC brake current is used at start to premagnetize the motor before running. It improves the torque performance at start. Varying between 100 ms to 3 s, the time needed depends on motor size. A bigger motor requires a longer time. See parameter *ID 507*.

When Flying Start (see parameter *ID 505*) is used as start function, DC-braking at start is disabled.

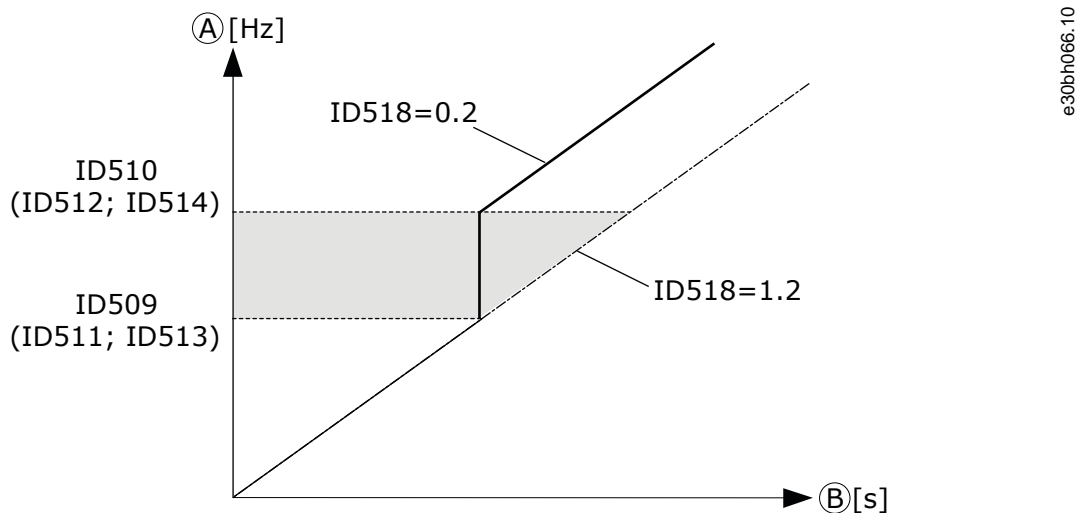
### 10.253 (ID 518) Acceleration/Deceleration Ramp Speed Scaling Ration between Prohibit Frequency Limits

Location in the menu:

- **P2.5.3** (Standard Application)
- **P2.5.7** (Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to set the multiplier of the selected ramp times when the output frequency of the drive is between the prohibited frequency limits.

Defines the acceleration/deceleration time when the output frequency is between the selected prohibit frequency range limits (parameters ID 509 to ID 514). The ramping speed (selected acceleration/ deceleration time 1 or 2) is multiplied by this factor. For example, value 0.1 makes the acceleration time 10 times shorter than outside the prohibit frequency range limits.



A $f_{out}$	B Time
-------------	--------

Illustration 73: Ramp Speed Scaling between Prohibit Frequencies

### 10.254 (ID 519) Flux Braking Current

Location in the menu: P2.4.13 (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to set the current level for the flux braking.

The value setting range depends on the used application.

### 10.255 (ID 520) Flux Braking

Location in the menu: P2.4.12 (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to enable Flux Braking. You can use flux braking as an alternative to DC-braking. Flux braking increases the braking capacity in conditions where extra brake resistors are not necessary.

When braking is necessary, the system decreases the frequency and increases the flux in the motor. It increases the capacity of the motor to brake. The motor speed is controlled during braking.

**NOTICE**

Use the braking only intermittently. Flux braking converts energy into heat and can damage the motor.

### 10.256 (ID 521) Motor Control Mode 2

Location in the menu: **P2.6.12** (Multi-purpose Control Application)

Use this parameter to set the AC drive control mode.

The used mode is determined with parameter *ID 164*.

For the selections, see parameter *ID 600*.

Motor control mode cannot be changed from Open Loop to Closed Loop and the opposite way while the drive is in *RUN* state.

### 10.257 (ID 530) Inching Reference 1

Location in the menu: **P2.2.7.27** (Multi-purpose Control Application)

Use this parameter to select the digital input signal that activates the inching reference.

The inputs also start the drive when activated and if there is no Run Request command from anywhere else.

Negative reference is used for reverse direction (see parameters *ID 1239* and *ID 1240*).

The parameter is available for VACON® NXP drives only.

### 10.258 (ID 531) Inching Reference 2

Location in the menu: **P2.2.7.28** (Multi-purpose Control Application)

Use this parameter to select the digital input signal that activates the inching reference.

The inputs also start the drive when activated and if there is no Run Request command from anywhere else.

Negative reference is used for reverse direction (see parameters *ID 1239* and *ID 1240*).

The parameter is available for VACON® NXP drives only.

### 10.259 (ID 532) Enable Inching

Location in the menu: **P2.2.7.26** (Multi-purpose Control Application)

Use this parameter to select the digital input signal that activates the inching function.

Inching is a combination of a start command and preset speeds (*ID 1239* and *ID 1240*) with a ramp time (*ID 533*).

When using the inching function, the input value must be TRUE set by a digital signal or by setting the value of the parameter to 0.2.

The parameter is available for VACON® NXP drives only.

### 10.260 (ID 534) Enable I/f control

Location in the menu: **P2.6.14.10** (Multi-Purpose Control application)

Use this parameter to enable I/F-control.

### 10.261 (ID 550) Fieldbus Data In Selection 9

Location in the menu: **P2.9.27** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to select a parameter or monitoring value to be controlled from the fieldbus.

These parameters are visible only if the option board installed to AC drive supports 16 Process data items.

As the value of these parameters, enter the ID number of the item to control. See [table 46](#).

### 10.262 (ID 551) Fieldbus Data In Selection 10

Location in the menu: **P2.9.28** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to select a parameter or monitoring value to be controlled from the fieldbus.

See [10.261 \(ID 550\) Fieldbus Data In Selection 9](#).

### 10.263 (ID 552) Fieldbus Data In Selection 11

Location in the menu: **P2.9.27** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to select a parameter or monitoring value to be controlled from the fieldbus.

See [10.261 \(ID 550\) Fieldbus Data In Selection 9](#).

### 10.264 (ID 553) Fieldbus Data In Selection 12

Location in the menu: **P2.9.30** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to select a parameter or monitoring value to be controlled from the fieldbus.

See [10.261 \(ID 550\) Fieldbus Data In Selection 9](#).

### 10.265 (ID 554) Fieldbus Data In Selection 13

Location in the menu: **P2.9.31** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to select a parameter or monitoring value to be controlled from the fieldbus.

See [10.261 \(ID 550\) Fieldbus Data In Selection 9](#).

### 10.266 (ID 555) Fieldbus Data In Selection 14

Location in the menu: **P2.9.32** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to select a parameter or monitoring value to be controlled from the fieldbus.

See [10.261 \(ID 550\) Fieldbus Data In Selection 9](#).

### 10.267 (ID 556) Fieldbus Data In Selection 15

Location in the menu: **P2.9.33** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to select a parameter or monitoring value to be controlled from the fieldbus.

See [10.261 \(ID 550\) Fieldbus Data In Selection 9](#).

### 10.268 (ID 557) Fieldbus Data In Selection 16

Location in the menu: **P2.9.34** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to select a parameter or monitoring value to be controlled from the fieldbus.

See [10.261 \(ID 550\) Fieldbus Data In Selection 9](#).

### 10.269 (ID 558) Fieldbus Data Out Selection 9

Location in the menu: **P2.9.11** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to select the data that is sent to the fieldbus with the ID number of the parameter or monitor value.

These parameters are visible only if the option board installed to AC drive supports 16 Process data items.

See also [table 46](#) for more monitoring values.

### 10.270 (ID 559) Fieldbus Data Out Selection 10

Location in the menu: **P2.9.12** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to select the data that is sent to the fieldbus with the ID number of the parameter or monitor value.

See [10.269 \(ID 558\) Fieldbus Data Out Selection 9](#).

### 10.271 (ID 560) Fieldbus Data Out Selection 11

Location in the menu: **P2.9.13** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to select the data that is sent to the fieldbus with the ID number of the parameter or monitor value.

See [10.269 \(ID 558\) Fieldbus Data Out Selection 9](#).

### 10.272 (ID 561) Fieldbus Data Out Selection 12

Location in the menu: **P2.9.14** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to select the data that is sent to the fieldbus with the ID number of the parameter or monitor value.

See [10.269 \(ID 558\) Fieldbus Data Out Selection 9](#).

### 10.273 (ID 562) Fieldbus Data Out Selection 13

Location in the menu: **P2.9.15** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to select the data that is sent to the fieldbus with the ID number of the parameter or monitor value.

See [10.269 \(ID 558\) Fieldbus Data Out Selection 9](#).

### 10.274 (ID 563) Fieldbus Data Out Selection 14

Location in the menu: **P2.9.16** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to select the data that is sent to the fieldbus with the ID number of the parameter or monitor value.

See [10.269 \(ID 558\) Fieldbus Data Out Selection 9](#).

### 10.275 (ID 564) Fieldbus Data Out Selection 15

Location in the menu: **P2.9.17** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to select the data that is sent to the fieldbus with the ID number of the parameter or monitor value.

See [10.269 \(ID 558\) Fieldbus Data Out Selection 9](#).

### 10.276 (ID 565) Fieldbus Data Out Selection 16

Location in the menu: **P2.9.18** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to select the data that is sent to the fieldbus with the ID number of the parameter or monitor value.

See [10.269 \(ID 558\) Fieldbus Data Out Selection 9](#).

### 10.277 (ID 600) Motor Control Mode

Location in the menu: **P2.6.1** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to set the AC drive control mode.

**Table 113: Selections for Motor Control Mode in Different Applications**

Selection	Standard Application	Local/Remote Control Application	Multi-step Speed Control Application	PID Control Application	Multi-purpose Control Application	Pump and Fan Control Application
0	VACON® NXS/P	VACON® NXS/P	VACON® NXS/P	VACON® NXS/P	VACON® NXS/P	VACON® NXS
1	VACON® NXS/P	VACON® NXS/P	VACON® NXS/P	VACON® NXS/P	VACON® NXS/P	VACON® NXS
2	Not used	Not used	Not used	Not used	VACON® NXS/P	NA
3	VACON® NXP	VACON® NXP	VACON® NXP	VACON® NXP	VACON® NXP	NA
4	NA	NA	NA	NA	VACON® NXP	NA

Selection number	Selection name	Description
0	Frequency control	Drive frequency reference is set to output frequency without slip compensation. Finally, motor load defines the motor actual speed.
1	Speed control	Drive frequency reference is set to motor speed reference. The motor speed remains the same regardless of motor load. Slip is compensated.
2	Torque control	Speed reference is used as maximum speed limit and the motor produces torque within speed limit to achieve torque reference.
3	Speed ctrl (closed loop)	Drive frequency reference is set to motor speed reference. The motor speed remains the same regardless of motor load. In Closed Loop control mode, speed feedback signal is used to achieve optimum speed accuracy.
4	Torque ctrl (closed loop)	Speed reference is used as the maximum speed limit that depends on the torque speed limit CL (ID1278) and motor produces torque within speed limit to achieve torque reference. In Closed Loop control mode, speed feedback signal is used to achieve optimum torque accuracy.

### 10.278 (ID 601) Switching Frequency

Location in the menu: **P2.6.9** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to set the switching frequency of the AC drive.

When increasing the switching frequency, the capacity of the AC drive reduces. To reduce capacitive currents in the motor cable, when the cable is long, we recommend using a low switching frequency. To reduce the motor noise, use a high switching frequency.

The range of this parameter depends on the size of the AC drive:

**Table 114: Size-dependent Switching Frequencies**

Type	Min. [kHz]	Max. [kHz]	Default [kHz]
0003-0061 NX_2	1.0	16.0	10.0
0075-0300 NX_2	1.0	10.0	3.6
0003-0061 NX_5	1.0	16.0	10.0



Type	Min. [kHz]	Max. [kHz]	Default [kHz]
0072-0520 NX_5	1.0	6.0	3.6
0004-0590 NX_6	1.0	6.0	1.5

It is possible that the actual switching frequency reduces down to 1.5 kHz by thermal management functions. Consider the reduction when using sine wave filters or other output filters with a low resonance frequency. See parameters *ID 1084* and *ID 655*.

### 10.279 (ID 602) Field Weakening Point Frequency

Location in the menu:

- **P2.6.4** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application (VACON® NXS), Pump and Fan Control Application)
- **P2.6.14.3** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the output frequency at which the output voltage reaches the field weakening point voltage.

### 10.280 (ID 603) Voltage at Field Weakening Point

Location in the menu:

- **P2.6.5** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application (VACON® NXS), Pump and Fan Control Application)
- **P2.6.14.4** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the voltage at the field weakening point as a percentage of the motor nominal voltage.

Above the frequency at the field weakening point, the output voltage stays at the set maximum value. Below the frequency at the field weakening point, the U/f curve parameters control the output voltage. See the parameters *ID 109*, *ID 108*, *ID 604*, and *ID 605*.

When setting the parameters *ID 110* and *ID 111* (nominal voltage and nominal frequency of the motor), the parameters *ID 602* and *ID 603* automatically receive related values. To have different values for the field weakening point and the maximum output voltage, change these parameters only after setting the parameters *P3.1.1.1* and *P3.1.1.2*.

### 10.281 (ID 604) U/F Midpoint Frequency

Location in the menu:

- **P2.6.6** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application (VACON® NXS), Pump and Fan Control Application)
- **P2.6.14.5** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the middle point frequency of the U/f curve.

If the value of *ID 108* is programmable, this parameter gives the middle point frequency of the curve. See [illustration 25](#) and parameter *ID 605*.

## 10.282 (ID 605) U/F Midpoint Voltage

Location in the menu:

- **P2.6.7** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application (VACON® NXS), Pump and Fan Control Application)
- **P2.6.14.6** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the middle point voltage of the U/f curve.

If the value of *ID 108* is programmable, this parameter gives the middle point voltage of the curve. See [10.8 \(ID 108\) U/F Ratio Selection](#).

## 10.283 (ID 606) Output Voltage at Zero Frequency

Location in the menu:

- **P2.6.8** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application (VACON® NXS), Pump and Fan Control Application)
- **P2.6.14.7** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the zero frequency voltage of the U/f curve.

The default value is different for different unit sizes.

If the value of parameter *ID 108* is changed, this parameter is set to zero. See [illustration 25](#).

## 10.284 (ID 607) Overvoltage Controller

Location in the menu:

- **P2.6.10** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application (VACON® NXS), Pump and Fan Control Application)
- **P2.6.3** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the overvoltage controller out of operation.

When enabling *ID 607* or *ID 608*, the controllers start to monitor the changes in the supply voltage. The controllers change the output frequency when it becomes too high or too low.

To stop the operation of the undervoltage and the overvoltage controllers, disable these 2 parameters. It is useful if the supply voltage changes more than -15% to +10%, and if the application does not tolerate the operation of the controllers.

Selection number	Selection name	Description
0	Controller switched off	
1	Controller switched on (no ramping)	Minor adjustments of OP frequency are made.
2	Controller switched on (with ramping)	Controller adjusts OP freq. up to max.freq.

When a value other than 0 is selected, also the Closed Loop overvoltage controller becomes active (in Multi-Purpose Control application).

### 10.285 (ID 608) Undervoltage Controller

Location in the menu:

- **P2.6.11** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application (VACON® NXS), Pump and Fan Control Application)
- **P2.6.4** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the undervoltage controller out of operation.

See parameter *ID 607*.

Undervoltage controller is PI-type controller for which the input is the difference of undervoltage reference value and the DC-link voltage actual value. The controller output is additive to the frequency reference, that is, the undervoltage controller tries to decrease the motor speed when there is undervoltage. As an effect, the motoring power is reduced and extra generating power is obtained from the deceleration of the system inertia. UV-controller is activated when the DC-link voltage drops below the undervoltage reference voltage.

Overvoltage/undervoltage trips can occur when controllers are switched out of operation.

Selection number	Selection name	Description
0	Controller switched off	Both open and closed loop overvoltage controllers are off.
1	Controller switched on (no ramping)	Both open and closed loop overvoltage controllers are activated. If power is restored when the AC drive is at undervoltage, the controller output frequency regains the reference value.
2	Controller switched on (with ramping)	Both open and closed loop controllers are activated. If power is restored after the undervoltage controller has been active, the AC drive ramps to zero speed using ramp time 2 and generates an undervoltage fault (F9) with subcode S3.

When a value other than 0 is selected also the Closed Loop overvoltage controller becomes active (in Multi-Purpose Control application).

### 10.286 (ID 609) Torque Limit

Location in the menu: **P2.10.1** (Multi-purpose Control Application)

Use this parameter to set the torque limit control between 0.0–300.0%.

In the Multi-Purpose Control application, the torque limit is selected between the minimum of this parameter and the motoring and generating torque limits *ID 1287* and *ID 1288*.

### 10.287 (ID 610) Torque Limit Control P-Gain

Location in the menu: **P2.10.2** (Multi-purpose Control Application)

Use this parameter to set the P-gain of the torque limit controller.

This parameter determines the P-gain of the torque limit controller. It is used in Open Loop control mode only.

## 10.288 (ID 611) Torque Limit Control I-Gain

Location in the menu: **P2.10.3** (Multi-purpose Control Application)

Use this parameter to set the I-gain of the torque limit controller.

This parameter determines the I-gain of the torque limit controller. It is used in Open Loop control mode only.

## 10.289 (ID 612) Magnetizing Current

Location in the menu:

- **P2.6.14.1** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application)
- **P2.6.17.1** (Multi-purpose Control Application, VACON® NXS)
- **P2.6.15.1** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the magnetizing current of the motor.

The magnetizing current (no-load current) of the motor identifies the values of the U/f parameters when they are given before the identification run. If the value is set to 0, the magnetizing current is calculated internally.

In VACON® NXP, the values of the U/f parameters are identified according to the magnetizing current if given before identification. See [10.524 Closed Loop Parameters \(IDs 612–621\)](#).

## 10.290 (ID 613) Speed Control P-Gain

Location in the menu:

- **P2.6.14.2** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application)
- **P2.6.17.2** (Multi-purpose Control Application, VACON® NXS)
- **P2.6.15.2** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set gain for the speed controller as a percentage per Hz.

When the gain value is 100%, the nominal torque reference is produced at the speed controller output for a frequency error of 1 Hz. See [10.524 Closed Loop Parameters \(IDs 612–621\)](#).

## 10.291 (ID 614) Speed Control I-Time

Location in the menu:

- **P2.6.14.3** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application)
- **P2.6.17.3** (Multi-purpose Control Application, VACON® NXS)
- **P2.6.15.3** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the integral time constant for the speed controller.

See [10.524 Closed Loop Parameters \(IDs 612–621\)](#).

SpeedControl Output(k) = SPC OUT(k-1) + SPC Kp\*[Speed Error(k) – Speed Error (k-1)] + Ki\*Speed error(k)

where Ki = SPC Kp\*Ts/SPC Ti.

## 10.292 (ID 615) Zero Speed Time at Start

Location in the menu:

- **P2.6.14.9** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application)
- **P2.6.17.9** (Multi-purpose Control Application, VACON® NXS)
- **P2.6.15.9** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the time during which the AC drive stays at zero speed after the start command.

The speed will be released to follow the set frequency/ speed reference after this time has elapsed from the instant where the command is given. See [10.524 Closed Loop Parameters \(IDs 612–621\)](#).

## 10.293 (ID 616) Zero Speed Time at Stop

Location in the menu:

- **P2.6.14.10** (Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application)
- **P2.6.17.10** (Multi-purpose Control Application, VACON® NXS)
- **P2.6.23.10** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the time during which the AC drive stays at zero speed after the stop command.

This parameter has no effect if the selected stop function (*ID 506*) is Coasting. The zero speed time starts when the ramp time is expected to reach zero speed. See [10.524 Closed Loop Parameters \(IDs 612–621\)](#).

## 10.294 (ID 617) Current Control P Gain

Location in the menu:

- **P2.6.14.17** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application)
- **P2.6.17.17** (Multi-purpose Control Application, VACON® NXS)
- **P2.6.15.17** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to adjust the P-gain of the current controller.

This controller is active only in closed loop control mode. The controller generates the voltage vector reference to the modulator. See [10.524 Closed Loop Parameters \(IDs 612–621\)](#).

## 10.295 (ID 618) Encoder Filter Time

Location in the menu:

- **P2.6.14.15** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application)
- **P2.6.17.15** (Multi-purpose Control Application, VACON® NXS)
- **P2.6.15.15** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the filtering time for the speed measurement.

The parameter can be used to eliminate encoder signal noise. Too high a filter time reduces speed control stability. See [10.524 Closed Loop Parameters \(IDs 612–621\)](#).

## 10.296 (ID 619) Slip Adjust

Location in the menu:

- **P2.6.14.6** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application)
- **P2.6.17.6** (Multi-purpose Control Application, VACON® NXS)
- **P2.6.15.6** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to adjust the voltage of the motor when the motor is loaded.

The motor nameplate speed is used to calculate the nominal slip. This value is used to adjust the voltage of motor when loaded. The nameplate speed is sometimes a little inaccurate and this parameter can therefore be used to trim the slip. Reducing the slip adjust value increases the motor voltage when the motor is loaded. Value 100% corresponds to nominal slip at nominal load. See [10.524 Closed Loop Parameters \(IDs 612–621\)](#).

## 10.297 (ID 620) Load Drooping

Location in the menu:

- **P2.6.12** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application)
- **P2.6.15** (Multi-purpose Control Application, VACON® NXS)
- **P2.6.6** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to enable the Load Drooping function.

The Load drooping function enables a speed drop. This parameter sets the drooping in percentage of the nominal torque of the motor.

You can use this function when a balanced load is necessary for mechanically connected motors.

If the motor has a nominal frequency of 50 Hz, the motor is loaded with the nominal load (100% of the torque), and Load Drooping is set to 10%, the output frequency is let to decrease 5 Hz from the frequency reference.

## 10.298 (ID 621) Startup Torque

Location in the menu:

- **P2.6.14.11** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application)
- **P2.6.17.11** (Multi-purpose Control Application, VACON® NXS)
- **P2.6.15.11** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to select the start-up torque.

Torque Memory is used in crane applications. Startup Torque FWD/REV can be used in other applications to help the speed controller. See [10.524 Closed Loop Parameters \(IDs 612–621\)](#).

Selection number	Selection name	Description
0	Not Used	
1	TorqMemory	Motor is started at the same torque as it was stopped at.
2	Torque Reference	Torque reference is used at start for the start-up torque.
3	Torque forward/Torque reverse	See ID 633 and ID 634.

### 10.299 (ID 626) Acceleration Compensation

Location in the menu:

- **P2.6.14.5** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application)
- **P2.6.17.5** (Multi-purpose Control Application, VACON® NXS)
- **P2.6.15.5** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the inertia compensation to make the speed response during acceleration and deceleration more accurate.

The time is defined as acceleration time to nominal speed with nominal torque. This feature is used when the inertia of the system is known to achieve the best speed accuracy at alternating references.

$$AccelCompensationTC = J \cdot \frac{2\pi \cdot f_{nom}}{T_{nom}} = J \cdot \frac{(2\pi \cdot f_{nom})^2}{P_{nom}}$$

e30bh089.10

<b>J</b> System inertia (kg*m <sup>2</sup> )	<b>f<sub>nom</sub></b> Motor nominal frequency (Hz)
<b>T<sub>nom</sub></b> Motor nominal torque	<b>P<sub>nom</sub></b> Motor nominal power (kW)

### 10.300 (ID 627) Magnetizing Current at Start

Location in the menu:

- **P2.6.14.7** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application)
- **P2.6.17.7** (Multi-purpose Control Application, VACON® NXS)
- **P2.6.15.7** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the DC current that is fed into the motor at the start.

Defines the current that is applied to motor when the start command is given (in Closed Loop control mode). At start this parameter is used together with parameter ID 628 to decrease the time before the motor is able to produce maximum torque.

### 10.301 (ID 628) Magnetizing Time at Start

Location in the menu:

- **P2.6.14.8** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application)
- **P2.6.17.8** (Multi-purpose Control Application, VACON® NXS)
- **P2.6.15.8** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the time during which the DC current is fed to the motor before the acceleration starts.

Defines the time for how long the magnetization current (*ID 627*) is applied to the motor at start. The magnetizing current at start is used to premagnetize the motor before running. It improves the torque performance at start. The time needed depends on the size of the motor. The parameter value varies from 100 ms to 3 s. The bigger the motor the more time is needed.

### 10.302 (ID 631) Identification

Location in the menu:

- **P2.6.12** (Pump and Fan Control Application)
- **P2.6.13** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application)
- **P2.6.16** (Multi-purpose Control Application, VACON® NXS)
- **P2.6.7** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to find the parameter values that are optimal for the operation of the drive.

The identification run calculates or measures the motor parameters that are necessary for a good control of the motor and speed.

The identification run helps in adjusting the motor-specific and the drive-specific parameters. It is a tool for the commissioning and the servicing of the drive. The goal is to find the parameter values that are optimal for the operation of the drive.

Before the identification run, set the following motor nameplate parameters:

- ID 110 Nominal voltage of the motor (P2.1.6)
- ID 111 Nominal frequency of the motor (P2.1.7)
- ID 112 Nominal speed of the motor (P2.1.8)
- ID 113 Nominal current of the motor (P2.1.9)
- ID 120 Motor cos phi (P2.1.10)

Selection number	Selection name	Description
0	No action	No identification requested.
1	Identification without motor run	The drive is run without speed to identify the motor parameters. The motor is supplied with current and voltage but with zero frequency. U/f ratio is identified.
2	Identification with motor run (VACON® NXP only)	The drive is run with speed to identify the motor parameters. U/f ratio and magnetization current are identified.  This identification run must be performed with no load on the motor shaft for accurate results.
3	Encoder identification run	Identifies the shaft zero position when using PMS motor with absolute encoder.
4	(Reserved)	
5	Identification failed	This value is stored if identification fails.



To activate the Identification function, set this parameter and give a start command. Give the start command in 20 s. If there is no start command in that time, the identification run does not start. The parameter is reset to the default value and an identification alarm shows.

To stop the identification run before it is completed, give a stop command. It resets the parameter to the default value. If the identification run is not completed, an identification alarm shows.

During Identification Run, the brake control is disabled (see [10.519 External Brake Control with Additional Limits \(IDs 315, 316, 346–349, 352, 353\)](#)).

Rising edge required to start after identification.

### 10.303 (ID 633) Start-up Torque, Forward

Location in the menu:

- **P2.6.14.12** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application)
- **P2.6.17.12** (Multi-purpose Control Application, VACON® NXS)
- **P2.6.15.12** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the start-up torque for forward direction when StartUp Torque is in use.

Sets the start-up torque for forward direction when selected with parameter *ID 621*.

### 10.304 (ID 634) Start-up Torque, Reverse

Location in the menu:

- **P2.6.14.8** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application)
- **P2.6.17.8** (Multi-purpose Control Application, VACON® NXS)
- **P2.6.15.8** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the start-up torque for reverse direction when StartUp Torque is in use.

Sets the start-up torque for reverse direction when selected with parameter *ID 621*.

### 10.305 (ID 636) Open Loop Torque Control Minimum Frequency

Location in the menu: **P2.10.8** (Multi-purpose Control Application)

Use this parameter to set the output frequency limit below which the drive operates in the frequency control mode.

Because of the nominal slip of the motor, the internal torque calculation is inaccurate at low speeds where it is recommended to use the frequency control mode.

### 10.306 (ID 637) Speed Controller P-Gain, Open Loop

Location in the menu:

- **P2.6.13** (Multi-purpose Control Application, VACON® NXS)
- **P2.6.14.8** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the P gain for the speed controller.

### 10.307 (ID 638) Speed Controller I-Gain, Open Loop

Location in the menu:

- **P2.6.14** (Multi-purpose Control Application, VACON® NXS)
- **P2.6.14.9** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the I gain for the speed controller.

### 10.308 (ID 639) Open Loop Torque Control P Gain

Location in the menu: **P2.10.9** (Multi-purpose Control Application)

Use this parameter to set the P gain for the torque controller in the open loop control mode.

### 10.309 (ID 640) Open Loop Torque Control I Gain

Location in the menu: **P2.10.10** (Multi-purpose Control Application)

Use this parameter to set the I gain for the torque controller in the open loop control mode.

### 10.310 (ID 641) Torque Reference Selection

Location in the menu: **P2.10.4** (Multi-purpose Control Application)

Use this parameter to select the torque reference.

See [10.523 Fieldbus Control Parameters \(IDs 850–859\)](#).

### 10.311 (ID 642) Torque Maximum Reference

Location in the menu: **P2.10.5** (Multi-Pump Control Application)

Maximum torque reference for analog input reference selections 1–4. Scale the custom minimum and maximum levels for analog inputs within -300.0...300.0%.

### 10.312 (ID 643) Torque Minimum Reference

Location in the menu: **P2.10.6** (Multi-Pump Control Application)

Minimum torque reference for analog input reference selections 1–4. Scale the custom minimum and maximum levels for analog inputs within -300.0...300.0%.

### 10.313 (ID 644) Torque Speed Limit, Open Loop

Location in the menu: **P2.10.7** (Multi-Pump Control Application)

Use this parameter to select the maximum frequency for the torque control.

VACON® NXP drives have more selections for this parameter in Closed Loop control mode. See *ID 1278*.

### 10.314 (ID 645) Negative Torque Limit

Location in the menu: **P2.6.15.21** (Multi-Pump Control Application)

Use this parameter to set the torque limit for negative direction.

### 10.315 (ID 646) Positive Torque Limit

Location in the menu: **P2.6.15.22** (Multi-Pump Control Application)

Use this parameter to set the torque limit for positive direction.

### 10.316 (ID 649) PMS Motor Zero Shaft Position

Location in the menu: **P2.6.16.2** (Multi-Pump Control Application)

Use this parameter to set the zero shaft position.

Updated during encoder identification run with an absolute encoder.

### 10.317 (ID 650) Motor Type

Location in the menu: **P2.6.16.1** (Multi-Pump Control Application)

Use this parameter to set the type of motor in your process.

### 10.318 (ID 651) Flux Current KP

Location in the menu: **P2.6.16.8** (Multi-Pump Control Application)

Use this parameter to set the gain for the flux current controller.

Defines the gain for the flux current controller when using a PMS motor. Depending on the motor construction and the ramp rate that is used to go to the field weakening area, high gain can be needed so that the output voltage does not reach maximum limit and prevent proper motor control. Too high gain can lead to unstable control. Integration time is more significant in this case for control.

### 10.319 (ID 652) Flux Current Time

Location in the menu: **P2.6.16.9** (Multi-Pump Control Application)

Use this parameter to set the integration time for the flux current controller.

Defines the integration time for the flux current controller when using a PMS motor. Depending on motor construction and the ramp rate that is used to go to field weakening area, short integration times can be needed so that the output voltage does not reach maximum limit and prevent proper motor control. Too fast integration time can also lead to unstable control.

### 10.320 (ID 655) Modulation Limit

Location in the menu: **P2.6.15.34** (Multi-Pump Control Application)

Use this parameter to control how the AC drive modulates the output voltage.

Reducing this value limits the maximum output voltage. If a sinusoidal filter is used set this parameter to 96%.

### 10.321 (ID 656) Load Drooping Time

Location in the menu: **P2.6.9** (Multi-purpose Control Application)

Use this parameter to set the drooping time of the motor. Use load drooping to get a dynamic speed drooping when the load changes. This parameter gives the time during which the speed is restored 63% of the change.

### 10.322 (ID 657) Current Control Time

Location in the menu: **P2.6.15.18** (Multi-purpose Control Application)

Use this parameter to adjust the integrator time constant of current controller. This value is presented in seconds.

### 10.323 (ID 662) Measured Voltage Drop

Location in the menu:

- **P2.6.18.16** (Multi-purpose Control Application, VACON® NXS)
- **P2.6.17.16** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the measured voltage drop at stator resistance between two phases with the nominal current of the motor.

The measured voltage drop at stator resistance between two phases with the nominal current of the motor. This parameter is identified during the ID run. Set this value to gain the optimum torque calculation for Open Loop low frequencies.

### 10.324 (ID 664) IR: Add Zero Point Voltage

Location in the menu:

- **P2.6.18.17** (Multi-purpose Control Application, VACON® NXS)
- **P2.6.17.17** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the amount of voltage that is fed to the motor at zero speed when the torque boost is used.

### 10.325 (ID 665) IR: Add Generator Scale

Location in the menu:

- **P2.6.18.18** (Multi-purpose Control Application, VACON® NXS)
- **P2.6.17.18** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the scaling factor for the generating side IR-compensation when the torque boost is used.

### 10.326 (ID 667) IR: Add Motoring Scale

Location in the menu:

- **P2.6.18.19** (Multi-purpose Control Application, VACON® NXS)
- **P2.6.17.19** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the scaling factor for the motoring side IR-compensation when the torque boost is used.

### 10.327 (ID 668) IU Offset

Location in the menu:

- **P2.6.18.20** (Multi-purpose Control Application, VACON® NXS)
- **P2.6.17.22** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the offset value for the phase current measurement.

### 10.328 (ID 669) IV Offset

Location in the menu:

- **P2.6.18.21** (Multi-purpose Control Application, VACON® NXS)
- **P2.6.17.23** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the offset value for the phase current measurement.

### 10.329 (ID 670) IW Offset

Location in the menu:

- **P2.6.18.22** (Multi-purpose Control Application, VACON® NXS)
- **P2.6.17.23** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the offset value for the phase current measurement.

### 10.330 (ID 673) LS Voltage Drop

Location in the menu: **P2.6.17.21** (Multi-purpose Control Application)

Use this parameter to set the LS voltage drop between two phases.

Leakage inductance voltage drop with nominal current and frequency of the motor. This parameter defines the LS voltage drop between two phases. Use the identification run to determine the optimum setting.

### 10.331 (ID 674) MotorBEM Voltage

Location in the menu: **P2.6.17.20** (Multi-purpose Control Application)

Use this parameter to adjust the motor-induced back voltage.

### 10.332 (ID 700) Response to the 4 mA Reference Fault

Location in the menu: **P2.7.1** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to select the response of the AC drive to a '4 mA Input' fault.

Selection number	Selection name	Description
0	No response	
1	Warning	
2	Warning	The frequency from 10 s back is set as reference.
3	Warning	The 4 mA fault frequency (parameter ID 728) is set as reference.
4	Fault	Stop mode after fault according to ID 506.
5	Fault	Stop mode after fault always by coasting.

A warning or a fault action and message is generated if the 4–20 mA reference signal is used and the signal falls below 3.0 mA for 5 s or below 0.5 mA for 0.5 s. The information can be also programmed into digital output DO1 and relay outputs RO1 and RO2.

### 10.333 (ID 701) Response to External Fault

Location in the menu: **P2.7.3** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to select the response of the drive to an 'External Fault'.

A warning or a fault action and message is generated from the external fault signal in the programmable digital inputs DIN 3 or with parameters ID 405 and ID 406. The information can be also programmed into digital output DO1 and relay outputs RO1 and RO2.

### 10.334 (ID 702) Output Phase Supervision

Location in the menu: **P2.7.6** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to select the response of the drive to an 'Output Phase' fault.

Output phase supervision of the motor ensures that the motor phases have an approximately equal current.

### 10.335 (ID 703) Earth Fault

Location in the menu: **P2.7.7** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to select the response of the drive to an 'Earth Fault'.

Earth fault protection ensures that the sum of the motor phase currents is zero. The overcurrent protection is always working and protects the AC drive from earth faults with high currents.

### 10.336 (ID 704) Motor Thermal Protection

Location in the menu: **P2.7.8** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to select the response of the drive to 'Motor Overtemperature' fault.

Deactivating the protection, that is, setting parameter to 0, resets the thermal stage of the motor to 0%. See [10.520 Parameters of Motor Thermal Protection \(IDs 704–708\)](#).

Motor overtemperature sensing is required when the parameter is set to 0.

### 10.337 (ID 705) Ambient Temperature

Location in the menu: **P2.7.9** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to set the ambient temperature where the motor is installed. The temperature value is given in Celsius or Fahrenheit degrees.

The factor can be set between -100.0%...100.0% where

- -100.0% = 0 °C
- 0.0% = 40 °C
- 100.0% = 80 °C

See [10.520 Parameters of Motor Thermal Protection \(IDs 704–708\)](#).

### 10.338 (ID 706) Zero Speed Cooling Factor

Location in the menu: **P2.7.10** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to set the cooling factor at 0 speed in relation to the point where the motor operates at nominal speed without external cooling.

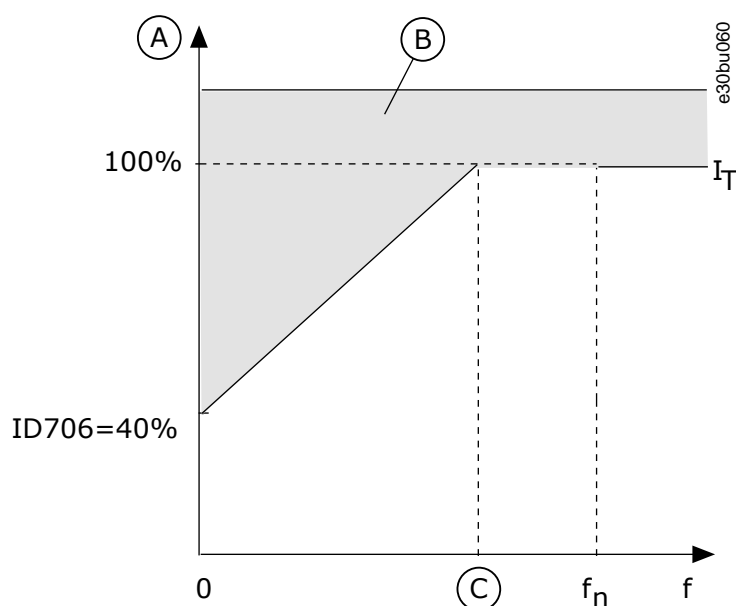
The default value is set for conditions where there is no external fan. When using an external fan, the value can be set higher than without the fan, for example at 90%.

When changing the parameter *Motor Nominal Current*, this parameter is automatically set to its default value.

Changing this parameter does not affect the maximum output current of the drive. Only parameter *P3.1.3.1 Motor Current Limit* can change the maximum output current.

Changing this parameter does not affect the maximum output current of the drive. See [10.520 Parameters of Motor Thermal Protection \(IDs 704–708\)](#).

The corner frequency for the thermal protection is 70% of the value of the parameter *Motor Nominal Frequency (ID 111)*.



A $P_{Cooling}$	B Overload area
C Corner frequency	

Illustration 75: The motor thermal current  $I_T$  curve

### 10.339 (ID 707) Motor Thermal Time Constant

Location in the menu: **P2.7.11** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to set the motor thermal time constant.

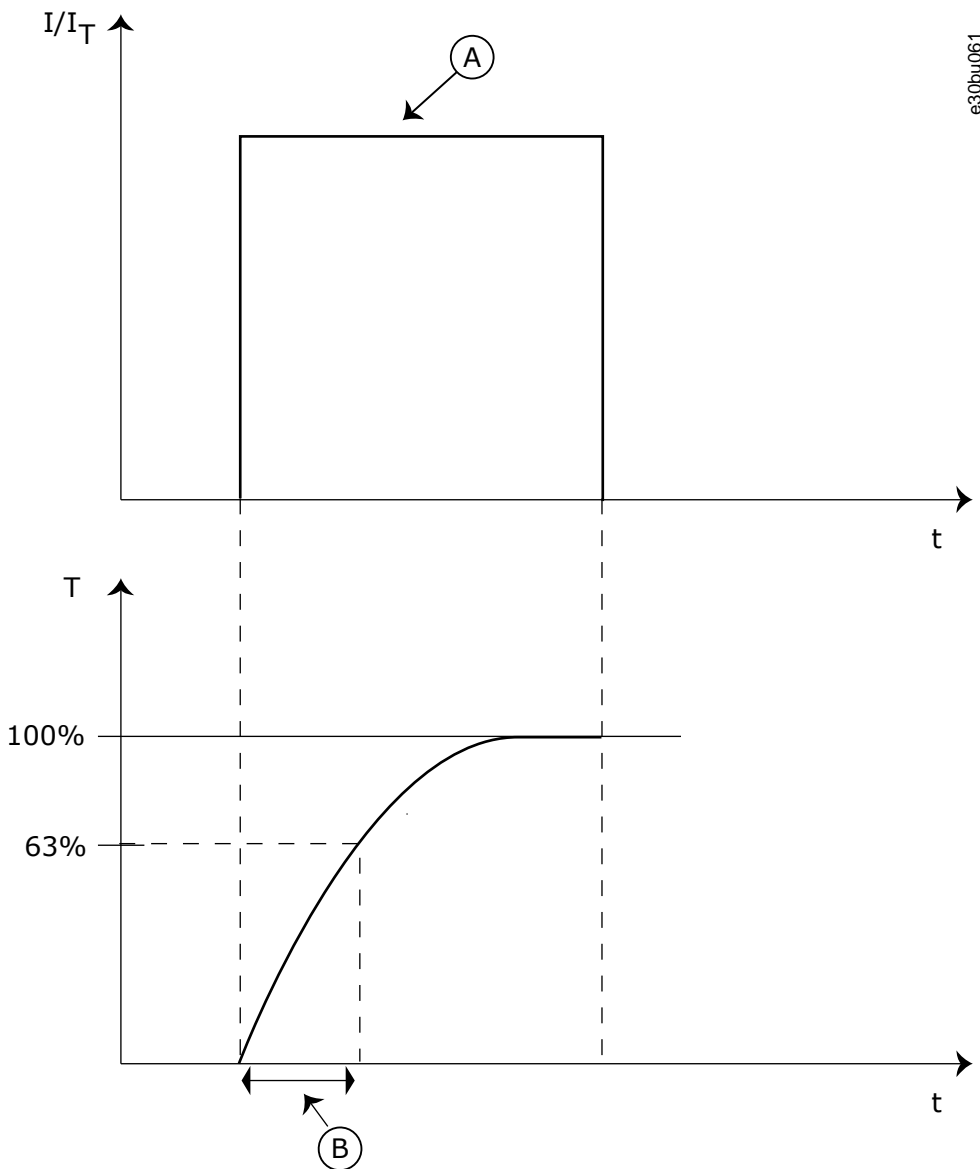
This time can be set between 1–200 minutes.

The time constant is the time within which the calculated thermal stage has reached 63% of its final value. The final thermal stage equals to running the motor continuously with nominal load at nominal speed. The length of the time constant is in relation with the dimension of the motor. The bigger the motor, the longer the time constant.

In different motors, the motor thermal time constant is different. It also changes between different motor manufacturers. The default value of the parameter changes from dimension to dimension.

The  $t_6$ -time is the time in seconds that the motor can safely operate at 6 times the rated current. It is possible that the motor manufacturer gives the data with the motor. Use this information to set the time constant parameter. Usually, the motor thermal time constant in minutes is  $2 \cdot t_6$ . When the drive is in the *STOP* state, the time constant is internally increased to 3 times the set parameter value, because the cooling operates based on convection.





A Current	B T = Motor thermal time constant
-----------	-----------------------------------

Illustration 76: The motor thermal time constant

### 10.340 (ID 708) Motor Thermal Protection: Motor Duty Cycle

Location in the menu: P2.7.12 (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to set the factor for the thermal loadability of the motor.

The value can be set to 0%-150%. See [10.520 Parameters of Motor Thermal Protection \(IDs 704–708\)](#).

For example, when the value is set to 130%, the motor goes to the nominal temperature with 130% of the motor nominal current.

See [illustration 76](#).

### 10.341 (ID 709) Stall Protection

Location in the menu: **P2.7.13** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to select the response of the drive to 'Motor Stall' fault.

Setting the parameter to 0 deactivates the protection and reset the stall time counter. See [10.521 Parameters of Stall Protection \(IDs 709–712\)](#).

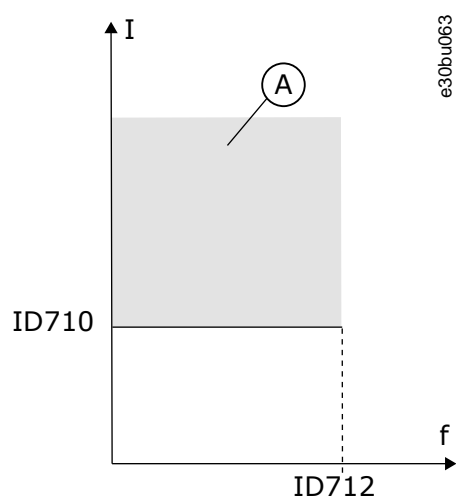
### 10.342 (ID 710) Stall Current

Location in the menu: **P2.7.11** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to set the limit above which the current of the motor must stay for a stall to occur.

The value of this parameter can be set between 0.0 and  $2 \cdot I_H$ . For a stall status to occur, the current must be higher than this limit. If parameter *ID 107* Nominal current limit of motor changes, this parameter is automatically calculated to 90% of the current limit. See [10.521 Parameters of Stall Protection \(IDs 709–712\)](#).

The value of the Stall Current must be below the motor current limit.



A Stall area

Illustration 77: The stall characteristics settings

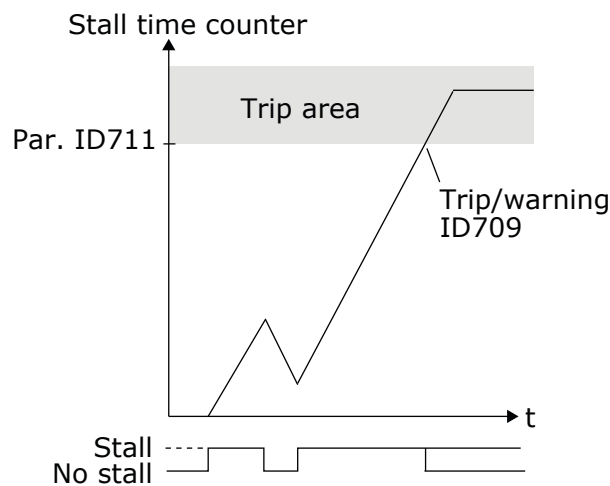
### 10.343 (ID 711) Stall Time Limit

Location in the menu: **P2.7.15** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to set the maximum time for a stall stage.

This parameter is the maximum time for the stall stage to be active before a motor stall fault occurs. The value of this parameter can be set between 1.0 s and 120.0 s. An internal counter counts the stall time. If the stall time counter value goes above this limit, the protection causes the drive to trip.

See [10.521 Parameters of Stall Protection \(IDs 709–712\)](#).



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Illustration 78: Stall Time Count

### 10.344 (ID 712) Stall Frequency Limit

Location in the menu: **P2.7.16** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to set the limit below which the output frequency of the drive must stay for a stall stage to occur.

The frequency can be set between  $1-f_{max}$  (ID 102).

For a stall state to occur, the output frequency must be below this limit for a certain time.

See [10.521 Parameters of Stall Protection \(IDs 709–712\)](#).

### 10.345 (ID 713) Underload Protection

Location in the menu: **P2.7.17** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to select the response of the drive to an 'Underload' fault.

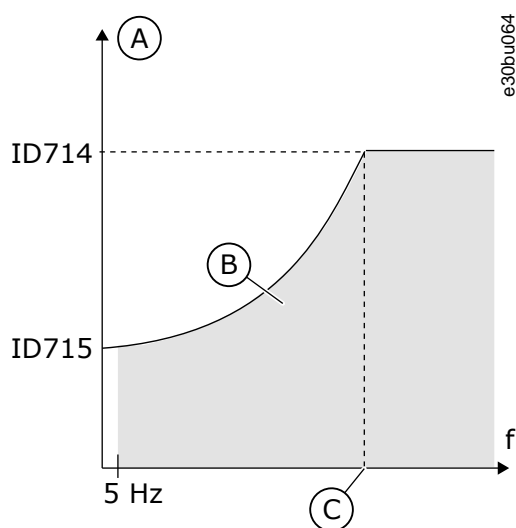
See [10.522 Parameters of Underload Protection \(IDs 713–716\)](#).

### 10.346 (ID 714) Underload Protection: Field Weakening Area Load

Location in the menu: **P2.7.18** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to set the minimum torque that the motor needs when the output frequency of the drive is higher than the frequency of the weakening point. You can set the value of this parameter between 10.0% and 150.0% x  $T_{nMotor}$ . This value is the limit for the minimum torque when the output frequency is above the field weakening point.

Changing parameter *ID 113* (Motor nominal current) restores this parameter automatically to its default value. See [10.522 Parameters of Underload Protection \(IDs 713–716\)](#).



<b>A</b> Torque	<b>B</b> Underload area
<b>C</b> Field weakening point	

Illustration 79: Setting of the minimum load

### 10.347 (ID 715) Underload Protection: Zero Frequency Load

Location in the menu: **P2.7.19** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to set the minimum torque that the motor needs when the output frequency of the drive is 0.

The torque limit can be set between 5.0–150.0% x  $T_{nMotor}$ . See [illustration 79](#). Changing the value of parameter *ID 113* (Motor nominal current), restores this parameter automatically to the default value. See [10.522 Parameters of Underload Protection \(IDs 713–716\)](#).

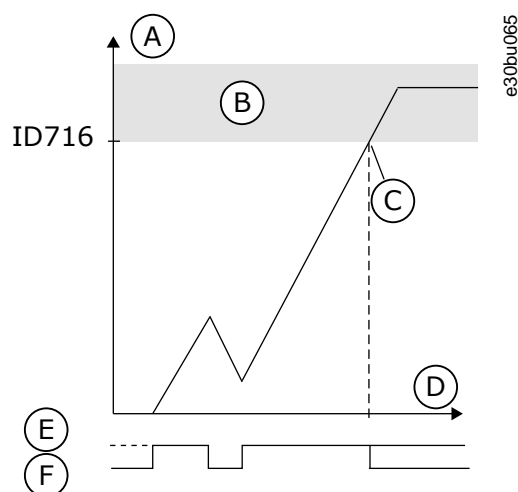
### 10.348 (ID 716) Underload Protection: Time Limit

Location in the menu: **P2.7.20** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to set the maximum time for an underload state. It is the maximum time for the underload state to be active before an underload fault occurs.

You can set the time limit between 2.0 s and 600.0 s.

An internal counter counts the underload time. If the value of the counter goes above this limit, the protection causes the drive to trip. The drive trips as is set in parameter *ID 713*. If the drive stops, the underload counter goes back to 0. See [illustration 80](#) and [10.522 Parameters of Underload Protection \(IDs 713–716\)](#).



A Underload time counter	B Trip area
C Trip/warning <i>ID 713</i>	D Time
E Underload	F No underload

Illustration 80: The Underload time counter function

### 10.349 (ID 717) Wait Time

Location in the menu: **P2.8.1** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

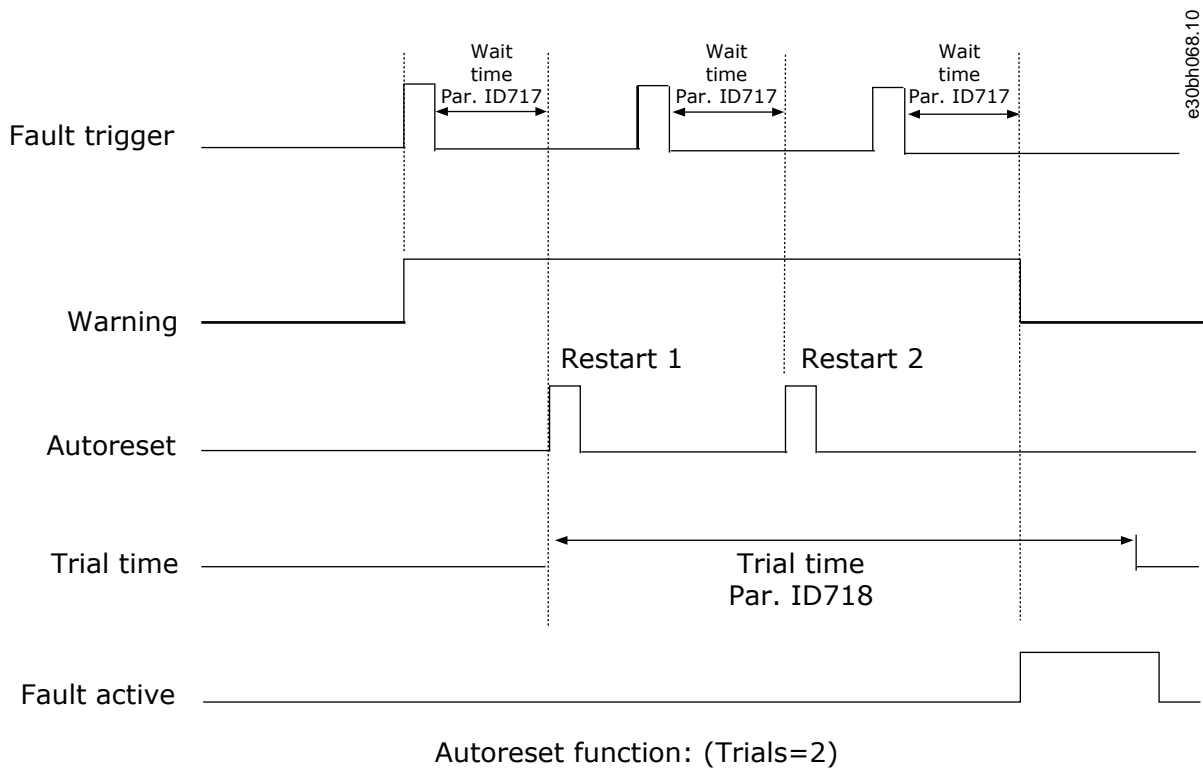
Use this parameter to set the wait time before the first reset is done.

### 10.350 (ID 718) Trial Time

Location in the menu: **P2.8.2** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to set the trial time for the automatic reset function. During the trial time, the automatic reset function tries to reset the faults that occur.

If the number of faults during the trial time exceed the value of the respective parameter set with *ID 720* to *ID 725*, a permanent fault is generated.



**Illustration 81: Example of Automatic Restarts with Two Restarts**

Parameters *ID 720* to *ID 725* determine the maximum number of automatic restarts during the trial time set by parameter *ID 718*. The time count starts from the first auto reset. If the number of faults occurring during the trial time exceeds the values of parameters *ID 720* to *ID 725*, the fault state becomes active. Otherwise the fault is cleared after the trial time has elapsed and the next fault start the trial time count again.

If a single fault remains during the trial time, a fault state is true.

### 10.351 (ID 719) Restart Function

Location in the menu: **P2.8.3** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to select the start mode for the Automatic reset function.

### 10.352 (ID 720) Automatic Restart: Number of Retries after Undervoltage Fault Trip

Location in the menu: **P2.8.4** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to set how many automatic restarts the AC drive can make during the set trial time after an undervoltage fault.

Selection number	Selection name	Description
0	No automatic restart	-
>0	Number of automatic restarts after undervoltage fault	The fault is reset and the drive is started automatically after the DC-link voltage has returned to the normal level.

### 10.353 (ID 721) Automatic Restart: Number of Retries after Overvoltage Fault Trip

Location in the menu: **P2.8.5** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to set how many automatic restarts the AC drive can make during the set trial time after an overvoltage fault.

Selection number	Selection name	Description
0	No automatic restart after overvoltage fault trip	-
>0	Number of automatic restarts after overvoltage fault	The fault is reset and the drive is started automatically after the DC-link voltage has returned to the normal level.

### 10.354 (ID 722) Automatic Restart: Number of Tries after Overcurrent Trip

Location in the menu: **P2.8.6** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to set how many automatic restarts the AC drive can make during the set trial time after an overcurrent fault.

IGBT temp fault also included.

- 0 = No automatic restart after overcurrent fault trip
- >0 = Number of automatic restarts after overcurrent trip and IGBT temperature faults.

### 10.355 (ID 723) Automatic Restart: Number of Tries after 4 mA Reference Trip

Location in the menu: **P2.8.7** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to set how many automatic restarts the AC drive can make during the set trial time after a 4 mA fault.

- 0 = No automatic restart after reference fault trip
- >0 = Number of automatic restarts after the analog current signal (4–20 mA) has returned to the normal level (>4 mA)

### 10.356 (ID 725) Automatic Restart: Number of Tries after External Fault Trip

Location in the menu: **P2.8.9** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to set how many automatic restarts the AC drive can make during the set trial time after an external fault.

- 0 = No automatic restart after External fault trip
- >0 = Number of automatic restarts after External fault trip

### 10.357 (ID 726) Automatic Restart: Number of Retries after Motor Temperature Fault Trip

Location in the menu: **P2.8.8** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to set how many automatic restarts the AC drive can make during the set trial time after a motor temperature fault.

- 0 = No automatic restart after Motor temperature fault trip
- >0 = Number of automatic restarts after the motor temperature has returned to its normal level.

### 10.358 (ID 727) Response to Undervoltage Fault

Location in the menu: **P2.7.5** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to enable the automatic reset after an undervoltage fault.

For the undervoltage limits, see the User Manual of the product.

### 10.359 (ID 728) 4 mA Fault Frequency Reference

Location in the menu: **P2.7.2** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to set the frequency reference of the motor after a 4 mA fault when the response to the 4 mA fault is a warning.

If the value of parameter *ID 700* is set to 3 and the 4 mA fault occurs, then the frequency reference to the motor is the value of this parameter.

### 10.360 (ID 730) Input Phase Supervision

Location in the menu: **P2.7.4** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to select the supply phase configuration of the drive.

The input phase supervision ensures that the input phases of the AC drive have an approximately equal current.

### 10.361 (ID 731) Automatic Restart

Location in the menu: **P2.20** (Basic Application)

Use this parameter to enable the Automatic reset function.



The function resets the following faults (maximum three times) (see the User Manual product:

- Overcurrent (F1)
- Overvoltage (F2)
- Undervoltage (F9)
- Frequency converter overtemperature (F14)
- Motor overtemperature (F16)
- Reference fault (F50)

### 10.362 (ID 732) Response to Thermistor Fault

Location in the menu: **P2.7.21** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to select the response of the drive to a 'Thermistor' fault.

Setting the parameter to 0 deactivates the protection.

### 10.363 (ID 733) Response to Fieldbus Fault

Location in the menu: **P2.7.22** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to select the response of the drive to a 'Fieldbus Timeout' fault.

For more information, see the respective Fieldbus Board Manual.

Selection number	Selection name	Description
0	No Action	No response
1	Warning	Warning
2	Fault	Fault, stop at fault according to parameter ID 506.
3	Fault, Coast	Fault, stop at fault always by coasting.
4	Warning: PresetF	Warning, frequency reference set to fieldbus fault preset frequency (parameter ID 1801). <sup>(1)</sup>

<sup>1</sup> VACON® NXP drives, Multi-purpose Control application only.

### 10.364 (ID 734) Response to Slot Fault

Location in the menu: **P2.7.23** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to select the response of the drive to a 'Slot Communication' fault.

Set here the response mode for a board slot fault due to missing or broken board.

See parameter *ID 732*.

### 10.365 (ID 738) Automatic Restart: Number of Tries after Underload Fault Trip

Location in the menu: **P2.8.10** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to enable the automatic reset after an underload fault.

### 10.366 (ID 739) TBoard1 Numbers (Number of PT100 Inputs in Use)

Location in the menu: **P2.7.24** (PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to select the number of sensors in use when a temperature board is installed.

The parameter name "*TBoard1 Numbers*" is used in Multi-Purpose Control Application. The old name (*Number of PT100 inputs in use*) is still used in PID Control Application and Pump and Fan Control Application.

If a temperature board is installed in your AC drive, use this parameter to select the number of sensors in use. See also the VACON® NX I/O Boards User Manual.

If the selected value is greater than the actual number of used sensors, the display reads 200°C. If the input is short-circuited, the shown value is -30°C.

### 10.367 (ID 740) TBoard Fault Response (Response to PT100 Fault)

Location in the menu: **P2.7.25** (PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to select the response of the drive to 'Temperature' fault.

The parameter name "*TBoard Fault Response*" is used in Multi-Purpose Control Application. The old name (*Response to PT100 fault*) is still used in PID Control Application and Pump and Fan Control Application.

### 10.368 (ID 741) TBoard1 Warning Limit (PT100 Warning Limit)

Location in the menu: **P2.7.26** (PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to set the temperature warning limit.

The parameter name "*TBoard1 Warning Limit*" is used in Multi-Purpose Control Application. The old name (*PT100 warning limit*) is still used in PID Control Application and Pump and Fan Control Application.

### 10.369 (ID 742) TBoard1 Fault Limit (PT100 Fault Limit)

Location in the menu: **P2.7.27** (PID Control Application, Multi-purpose Control Application, Pump and Fan Control Application)

Use this parameter to set the temperature fault limit.

The parameter name "*TBoard1 Fault Limit*" is used in Multi-Purpose Control Application. The old name (*PT100 fault limit*) is still used in PID Control Application and Pump and Fan Control Application.

### 10.370 (ID 743) TBoard2 Numbers

Location in the menu: **P2.7.37** (Multi-purpose Control Application)

Use this parameter to select the number of sensors in use when a temperature board is installed.

If a temperature board is installed in your AC drive, use this parameter to select the number of sensors in use. See also the VACON® NX I/O Boards User Manual.

If the selected value is greater than the actual number of used sensors, the display reads 200°C. If the input is short-circuited, the shown value is -30°C.

### 10.371 (ID 745) TBoard2 Warning Limit

Location in the menu: **P2.7.38** (Multi-purpose Control Application)

Use this parameter to set the temperature warning limit.

### 10.372 (ID 746) TBoard2 Fault Limit

Location in the menu: **P2.7.39** (Multi-purpose Control Application)

Use this parameter to set the temperature fault limit.

### 10.373 (ID 750) Cooling Monitor

Location in the menu: **P2.2.7.23** (Multi-purpose Control Application)

Use this parameter to select the digital input signal that shows the state of the used cooling unit. This parameter is used for liquid-cooled AC drives.

A fault is generated if the input is low when the drive is in *RUN* state. If the drive is in *STOP* state, only warning is generated. See VACON® NXP Liquid-Cooled Drives User Manual.

### 10.374 (ID 751) Cooling Fault Delay

Location in the menu: **P2.7.32** (Multi-purpose Control Application)

Use this parameter to set the delay after which the AC drive goes to *FAULT* state when there is no 'Cooling OK' signal.

### 10.375 (ID 752) Speed Error Fault Function

Location in the menu: **P2.7.33** (Multi-purpose Control Application)

Use this parameter to select the fault response when the speed reference and the encoder speed exceed the set limits.

### 10.376 (ID 753) Speed Error Maximum Difference

Location in the menu: **P2.7.34** (Multi-purpose Control Application)

Use this parameter to set the maximum difference between the speed reference and the encoder speed. When the difference goes outside this limit, a fault occurs.

The speed error refers to the difference between the speed reference and the encoder speed. This parameter defines the limit when a fault is generated.

### 10.377 (ID 754) Speed Error Delay

Location in the menu: **P2.7.35** (Multi-purpose Control Application)

Use this parameter to set the delay after which the AC drive goes to *FAULT* state when there is a speed error.

### 10.378 (ID 755) Safe Disable Mode

Location in the menu: **P2.7.36** (Multi-purpose Control Application)

Use this parameter to select the response to an activated safe disable mode.

See separate VACON® NX OPTAF (STO) Board Manual for detailed information on the Safe Disable function. This function is available only if the drive is equipped with VACON® option board OPTAF.

With this parameter, it is possible to select whether the activated safe disable function is responded as fault or warning. The safe disable input stops the drive modulation regardless of this parameter value.

### 10.379 (ID 756) Safe Disable Active

Location in the menu: **P2.3.3.30** (Multi-purpose Control Application)

Use this parameter to select the digital output signal that shows the status of the Safe Disable.

### 10.380 (ID 776) Response to Active Filter Fault

Location in the menu: **P2.7.41** (Multi-purpose Control Application, VACON®NXP)

Use this parameter to set the fault response for the active filter fault.

This parameter defines the response to be triggered when the active filter fault input (set with parameter *ID 214*) is closed.

See separate VACON® NX OPTAF (STO) Board Manual for detailed information on the Safe Disable function. This function is available only if the drive is equipped with VACON® option board OPTAF.

Selection number	Selection name	Description
0	No Action	No response
1	Warning	Warning
2	Fault	Fault, stop at fault according to parameter ID 506.
3	Fault, Coast	Fault, stop at fault always by coasting.

This parameter is present in VACON® NXP drives only.

### 10.381 (ID 850) Fieldbus Reference Minimum Scaling

Location in the menu: P2.9.1 (Multi-purpose Control Application)

Use this parameter to set scaling to the fieldbus reference signal.

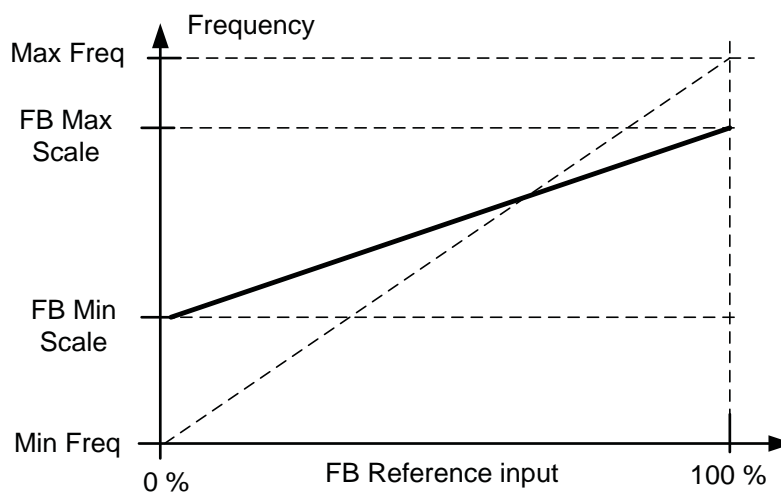
See [10.382 \(ID 851\) Fieldbus Reference Maximum Scaling](#).

### 10.382 (ID 851) Fieldbus Reference Maximum Scaling

Location in the menu: P2.9.2 (Multi-purpose Control Application)

Use this parameter to set scaling to the fieldbus reference signal.

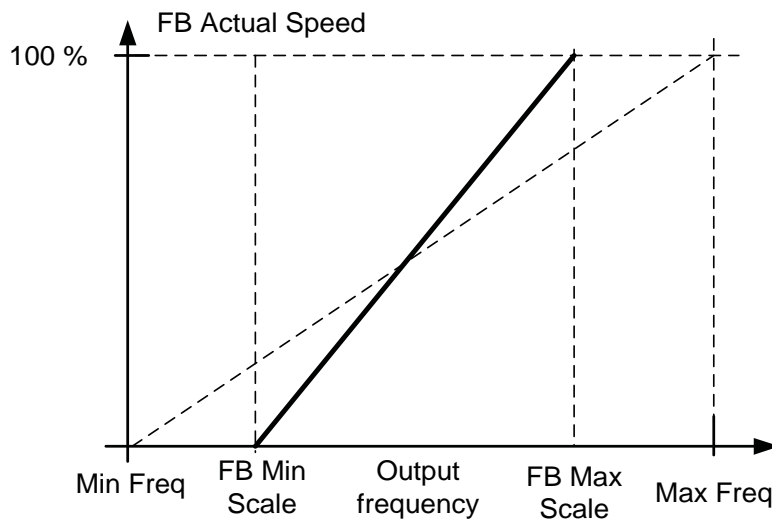
If both parameters (ID 850 & ID 851) have the same value, the minimum and maximum frequency limits are used for scaling.



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Illustration 82: Fieldbus Reference Minimum = Maximum Scaling

Using this custom scaling function also affects the scaling of the actual value.



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Illustration 83: Fieldbus Minimum and Maximum Scaling Effect on Actual Value

### 10.383 (ID 852) Fieldbus Process Data Out 1 Selection

Location in the menu: P2.9.3 (Multi-purpose Control Application)

Use this parameter to select the data that is sent to the fieldbus with the ID number of the parameter or monitor value.

To monitor an item, enter the ID number of the item as the value of this parameter.

See [10.523 Fieldbus Control Parameters \(IDs 850–859\)](#).

ID	Monitoring value	ID	Monitoring value
1	Output frequency	15	Digital inputs 1,2,3 statuses
2	Motor speed	16	Digital inputs 4,5,6 statuses
3	Motor current	17	Digital and relay output statuses
4	Motor torque	25	Frequency reference
5	Motor power	26	Analog output current
6	Motor voltage	27	AI3
7	DC-link voltage	28	AI4
8	Unit temperature	31	AO1 (expander board)
9	Motor temperature	32	AO2 (expander board)
13	AI1	37	Active fault 1
14	AI2	45	Motor current (drive independent) given with one decimal point.

See also [7.4.1 Monitoring Values \(Control Panel: Menu M1\)](#) for more monitoring values.

### 10.384 (ID 853) Fieldbus Process Data Out 2 Selection

Location in the menu: **P2.9.4** (Multi-purpose Control Application)

Use this parameter to select the data that is sent to the fieldbus with the ID number of the parameter or monitor value.

To monitor an item, enter the ID number of the item as the value of this parameter.

See [10.383 \(ID 852\) Fieldbus Process Data Out 1 Selection](#).

### 10.385 (ID 854) Fieldbus Process Data Out 3 Selection

Location in the menu: **P2.9.5** (Multi-purpose Control Application)

Use this parameter to select the data that is sent to the fieldbus with the ID number of the parameter or monitor value.

To monitor an item, enter the ID number of the item as the value of this parameter.

See [10.383 \(ID 852\) Fieldbus Process Data Out 1 Selection](#).

### 10.386 (ID 855) Fieldbus Process Data Out 4 Selection

Location in the menu: **P2.9.6** (Multi-purpose Control Application)

Use this parameter to select the data that is sent to the fieldbus with the ID number of the parameter or monitor value.

To monitor an item, enter the ID number of the item as the value of this parameter.

See [10.383 \(ID 852\) Fieldbus Process Data Out 1 Selection](#).

### 10.387 (ID 856) Fieldbus Process Data Out 5 Selection

Location in the menu: **P2.9.7** (Multi-purpose Control Application)

Use this parameter to select the data that is sent to the fieldbus with the ID number of the parameter or monitor value.

To monitor an item, enter the ID number of the item as the value of this parameter.

See [10.383 \(ID 852\) Fieldbus Process Data Out 1 Selection](#).

### 10.388 (ID 857) Fieldbus Process Data Out 6 Selection

Location in the menu: **P2.9.8** (Multi-purpose Control Application)

Use this parameter to select the data that is sent to the fieldbus with the ID number of the parameter or monitor value.

To monitor an item, enter the ID number of the item as the value of this parameter.

See [10.383 \(ID 852\) Fieldbus Process Data Out 1 Selection](#).

### 10.389 (ID 858) Fieldbus Process Data Out 7 Selection

Location in the menu: **P2.9.9** (Multi-purpose Control Application)

Use this parameter to select the data that is sent to the fieldbus with the ID number of the parameter or monitor value.

To monitor an item, enter the ID number of the item as the value of this parameter.

Location in the menu: **P2.9.4** (Multi-purpose Control Application)

### 10.390 (ID 859) Fieldbus Process Data Out 8 Selection

Location in the menu: **P2.9.10** (Multi-purpose Control Application)

Use this parameter to select the data that is sent to the fieldbus with the ID number of the parameter or monitor value.

To monitor an item, enter the ID number of the item as the value of this parameter.

See [10.383 \(ID 852\) Fieldbus Process Data Out 1 Selection](#).

### 10.391 (ID 861) FB Mode SlotD

Location in the menu: **P2.9.36** (Multi-Purpose Control Application)

Use this parameter to select the fieldbus mode for slot D.

Selection number	Selection name	Description
0	Normal	
1	Extended	Use this mode to extend process data IN and OUT from 8 to 16.
2	Fast	Use this mode to enabled processing of fieldbus data at 1 ms level, excluding PD IN and OUT data. 16 PD support included.
3	Fast PD	Use this mode to enabled processing of all fieldbus data at 1 ms level. 16 PD support included.

### 10.392 (ID 862) FB Mode SlotE

Location in the menu: **P2.9.37** (Multi-Purpose Control Application)

Use this parameter to select the fieldbus mode for slot E.



Selection number	Selection name	Description
0	Normal	
1	Extended	Use this mode to extend process data IN and OUT from 8 to 16.
2	Fast	Use this mode to enabled processing of fieldbus data at 1 ms level, excluding PD IN and OUT data. 16 PD support included.
3	Fast PD	Use this mode to enabled processing of all fieldbus data at 1 ms level. 16 PD support included.

### 10.393 (ID 876) Fieldbus Process Data In 1 Selection

Location in the menu: **P2.9.19** (Multi-purpose Control Application)

Use this parameter to select a parameter or monitoring value to be controlled from the fieldbus.

To control an item, enter the ID number of the item as the value of this parameter.

See [table 46](#).

### 10.394 (ID 877) Fieldbus Process Data In 2 Selection

Location in the menu: **P2.9.20** (Multi-purpose Control Application)

Use this parameter to select a parameter or monitoring value to be controlled from the fieldbus.

To control an item, enter the ID number of the item as the value of this parameter.

See [table 46](#).

### 10.395 (ID 878) Fieldbus Process Data In 3 Selection

Location in the menu: **P2.9.21** (Multi-purpose Control Application)

Use this parameter to select a parameter or monitoring value to be controlled from the fieldbus.

To control an item, enter the ID number of the item as the value of this parameter.

See [table 46](#).

### 10.396 (ID 879) Fieldbus Process Data In 4 Selection

Location in the menu: **P2.9.22** (Multi-purpose Control Application)

Use this parameter to select a parameter or monitoring value to be controlled from the fieldbus.

To control an item, enter the ID number of the item as the value of this parameter.

See [table 46](#).

### 10.397 (ID 880) Fieldbus Process Data In 5 Selection

Location in the menu: **P2.9.23** (Multi-purpose Control Application)

Use this parameter to select a parameter or monitoring value to be controlled from the fieldbus.

To control an item, enter the ID number of the item as the value of this parameter.

See [table 46](#).

### 10.398 (ID 881) Fieldbus Process Data In 6 Selection

Location in the menu: **P2.9.24** (Multi-purpose Control Application)

Use this parameter to select a parameter or monitoring value to be controlled from the fieldbus.

To control an item, enter the ID number of the item as the value of this parameter.

See [table 46](#).

### 10.399 (ID 882) Fieldbus Process Data In 7 Selection

Location in the menu: **P2.9.25** (Multi-purpose Control Application)

Use this parameter to select a parameter or monitoring value to be controlled from the fieldbus.

To control an item, enter the ID number of the item as the value of this parameter.

See [table 46](#).

### 10.400 (ID 883) Fieldbus Process Data In 8 Selection

Location in the menu: **P2.9.26** (Multi-purpose Control Application)

Use this parameter to select a parameter or monitoring value to be controlled from the fieldbus.

To control an item, enter the ID number of the item as the value of this parameter.

See [table 46](#).

### 10.401 (ID 896) Fieldbus State Machine

Location in the menu: **P2.9.35** (Multi-purpose Control Application)

Use this parameter to select the control profile (state machine) for the fieldbus control.

If ProfiDrive mode is selected, the fieldbus option board has to be set to bypass mode. See [10.531 Fieldbus Control in Detail](#) for further information.

Selection number	Selection name	Description
0	Standard	This mode makes the fieldbus control behave as explained in the used fieldbus option board manual.
1	ProfiDrive	This mode uses ProfiDrive state machine in application software.  This mode is possible to use only with the fieldbus boards that do not have their own state machine or have the possibility to bypass state machine functionality in the option board.

### 10.402 (ID 1001) Number of Auxiliary Drives

Location in the menu: **P2.9.1** (Pump and Fan Control Application)

Use this parameter to set the total number of auxiliary drives.

The functions controlling the auxiliary drives (parameters *ID 458* to *ID 462*) can be programmed to relay outputs or digital output. By default, one auxiliary drive is in use and it is programmed to relay output RO1 at B.1.

### 10.403 (ID 1002) Start Frequency, Auxiliary Drive 1

Location in the menu: **P2.9.2** (Pump and Fan Control Application)

Use this parameter to set the limit for the frequency of the AC drive that starts the auxiliary drive.

The frequency of the drive controlled by the AC drive must exceed the limit defined with these parameters with 1 Hz before the auxiliary drive is started. The 1 Hz overdraft makes a hysteresis to avoid unnecessary starts and stops.

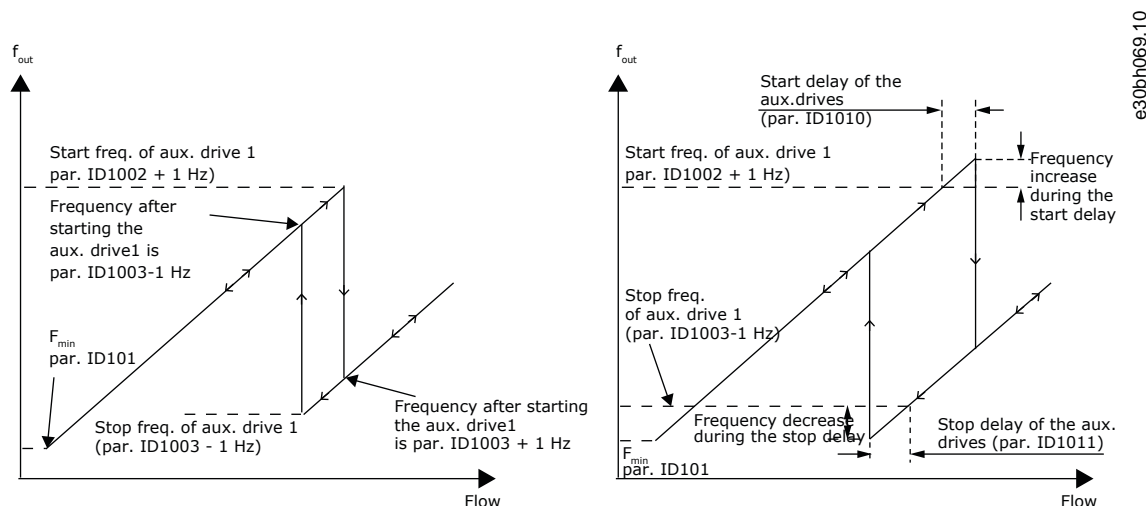


Illustration 84: Example of Parameter Setting; Variable Speed Drive and One Auxiliary Drive

### 10.404 (ID 1003) Stop Frequency, Auxiliary Drive 1

Location in the menu: **P2.9.3** (Pump and Fan Control Application)

Use this parameter to set the limit for the frequency of the AC drive that stops the auxiliary drive.

The frequency of the drive controlled by the AC drive must fall with 1 Hz below the limit defined with these parameters before the auxiliary drive is stopped. The stop frequency limit also defines the frequency to which the frequency of the drive controlled by the AC drive is dropped after starting the auxiliary drive. See [illustration 84](#).

#### 10.405 (ID 1004) Start Frequency, Auxiliary Drive 2

Location in the menu: **P2.9.4** (Pump and Fan Control Application)

Use this parameter to set the limit for the frequency of the AC drive that starts the auxiliary drive. See parameter *ID 1002*.

#### 10.406 (ID 1005) Stop Frequency, Auxiliary Drive 2

Location in the menu: **P2.9.5** (Pump and Fan Control Application)

Use this parameter to set the limit for the frequency of the AC drive that stops the auxiliary drive. See parameter *ID 1003*.

#### 10.407 (ID 1006) Start Frequency, Auxiliary Drive 3

Location in the menu: **P2.9.6** (Pump and Fan Control Application)

Use this parameter to set the limit for the frequency of the AC drive that starts the auxiliary drive. See parameter *ID 1002*.

#### 10.408 (ID 1007) Stop Frequency, Auxiliary Drive 3

Location in the menu: **P2.9.7** (Pump and Fan Control Application)

Use this parameter to set the limit for the frequency of the AC drive that stops the auxiliary drive. See parameter *ID 1003*.

#### 10.409 (ID 1008) Start Frequency, Auxiliary Drive 4

Location in the menu: **P2.9.8** (Pump and Fan Control Application)

Use this parameter to set the limit for the frequency of the AC drive that starts the auxiliary drive. See parameter *ID 1002*.

#### 10.410 (ID 1009) Stop Frequency, Auxiliary Drive 4

Location in the menu: **P2.9.9** (Pump and Fan Control Application)

Use this parameter to set the limit for the frequency of the AC drive that stops the auxiliary drive. See parameter *ID 1003*.

#### 10.411 (ID 1010) Start Delay of Auxiliary Drives

Location in the menu: **P2.9.10** (Pump and Fan Control Application)

Use this parameter to set the delay time to start the auxiliary drive.

The frequency of the drive controlled by the AC drive must remain above the start frequency of the auxiliary drive for the time defined with this parameter before the auxiliary drive is started. The delay defined applies to all auxiliary drives, which prevents unnecessary starts caused by momentary start limit exceedings. See [illustration 84](#).

### 10.412 (ID 1011) Stop Delay of Auxiliary Drives

Location in the menu: P2.9.11 (Pump and Fan Control Application)

Use this parameter to set the delay time to stop the auxiliary drive.

The frequency of the drive controlled by the AC drive must remain below the stop limit of the auxiliary drive for the time defined with this parameter before the drive is stopped. The delay defined applies to all auxiliary drives, which prevents unnecessary stops caused by momentary falls below the stop limit. See [illustration 84](#).

### 10.413 (ID 1012) Reference Step after Start of Auxiliary Drive 1

Location in the menu: P2.9.12 (Pump and Fan Control Application)

Use this parameter to set a reference step that is added to the reference value when the auxiliary drive is started.

The reference step is automatically added to the reference value always when the corresponding auxiliary drive is started. With the reference steps, for example, the pressure loss in the piping caused by the increased flow can be compensated.

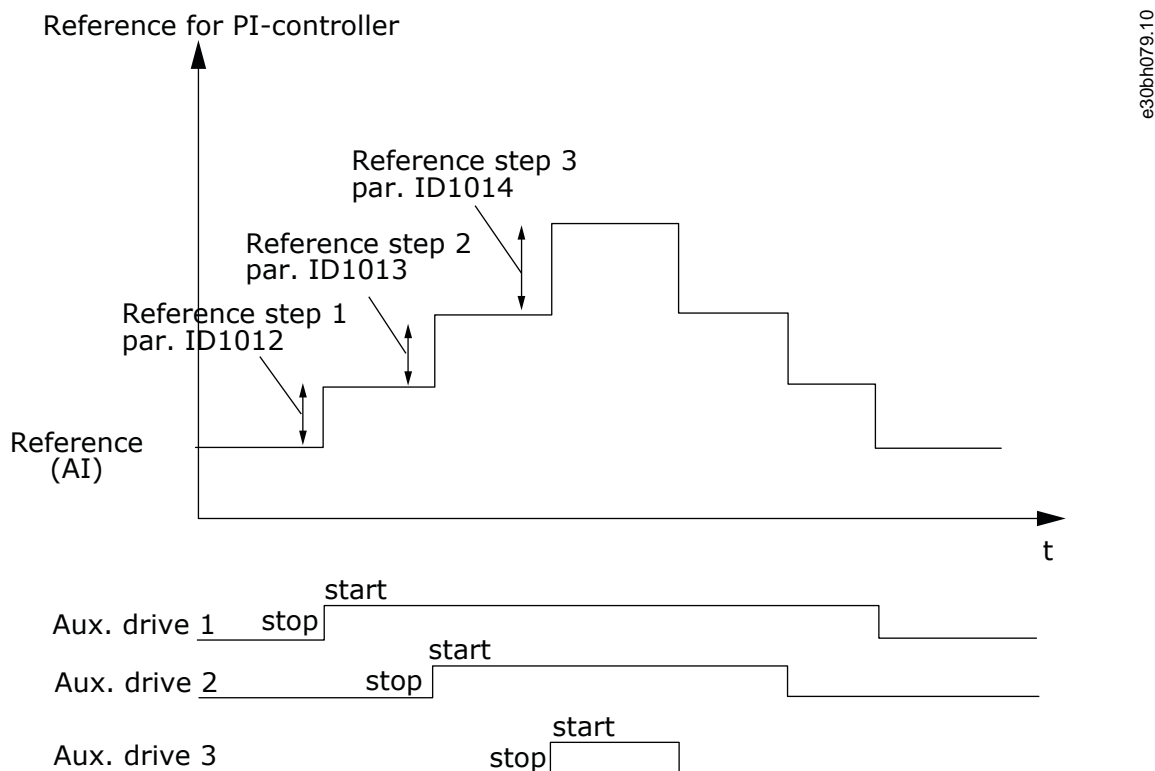


Illustration 85: Reference Steps after Starting Auxiliary Drives

#### 10.414 (ID 1013) Reference Step after Start of Auxiliary Drive 2

Location in the menu: **P2.9.13** (Pump and Fan Control Application)

Use this parameter to set a reference step that is added to the reference value when the auxiliary drive is started.

See [illustration 85](#).

#### 10.415 (ID 1014) Reference Step after Start of Auxiliary Drive 3

Location in the menu: **P2.9.14** (Pump and Fan Control Application)

Use this parameter to set a reference step that is added to the reference value when the auxiliary drive is started.

See [illustration 85](#).

#### 10.416 (ID 1015) Reference Step after Start of Auxiliary Drive 4

Location in the menu: **P2.9.15** (Pump and Fan Control Application)

Use this parameter to set a reference step that is added to the reference value when the auxiliary drive is started.

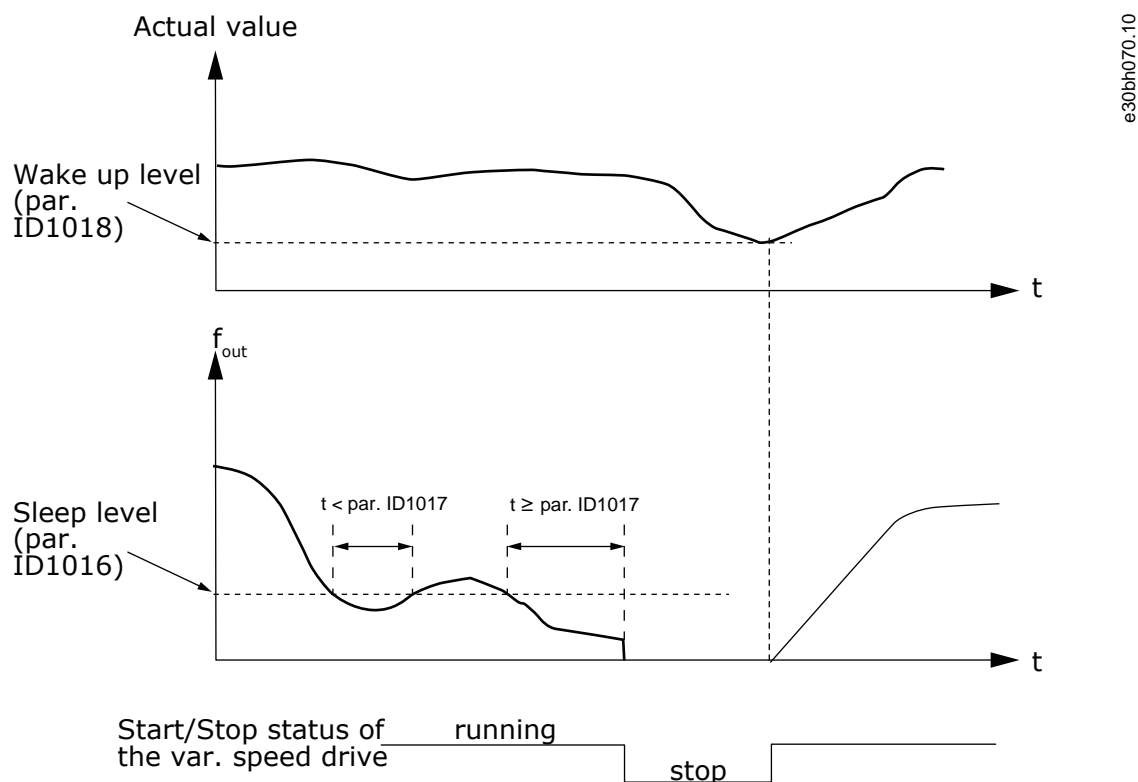
See [10.413 \(ID 1012\) Reference Step after Start of Auxiliary Drive 1](#).

#### 10.417 (ID 1016) Sleep Frequency

Location in the menu: **P2.1.15** (PID Control Application, Pump and Fan Control Application)

Use this parameter to set the limit below which the output frequency of the drive must stay for a set time before the drive goes to the sleep state.

The drive goes to sleep mode (that is, the drive stops) when the output frequency of the drive is less than the frequency limit that is set in this parameter for a time greater than that determined by parameter *ID 1017*. During the Stop state, the PID controller is operating switching the AC drive to Run state when the actual value signal either falls below or exceeds (see parameter *ID 1019*) the Wake-up level determined by parameter *ID 1018*.



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Illustration 86: AC Drive Sleep Function

### 10.418 (ID 1017) Sleep Delay

Location in the menu: **P2.1.16** (PID Control Application, Pump and Fan Control Application)

Use this parameter to set the minimum duration that the output frequency of the drive must stay below the set limit before the drive goes to the sleep state.

See [illustration 86](#).

### 10.419 (ID 1018) Wake Up Level

Location in the menu: **P2.1.17** (PID Control Application, Pump and Fan Control Application)

Use this parameter to set the level at which the drive wakes up from the sleep state.

The wake-up level defines the level below which the actual value must fall or which has to be exceeded before the Run state of the AC drive is restored.

See [illustration 86](#).

### 10.420 (ID 1019) Wake-Up Function

Location in the menu: **P2.1.18** (PID Control Application, Pump and Fan Control Application)

Use this parameter to select the operation for the wake-up level parameter.

This parameter defines whether the restoration of the Run state occurs when the actual value signal falls below or exceeds the *Wake-up level* (parameter ID 1018). See [10.419 \(ID 1018\) Wake Up Level](#) and [table \(ID 1019\) Wake Up Function > #X011213 > simpletable\\_uld\\_cx5\\_cgb](#).

The PID Control Application has selections 0–1 and Pump and Fan Control Application selections 0–3 available.

Selection number	Function	Limit	Description
0	Wake-up happens when actual value goes below the limit.	The limit defined with parameter ID 1018 is in percent of the maximum actual value.	<p>Actual value signal</p> <p>100%</p> <p>Par. ID1018=30%</p> <p>t</p> <p>Start Stop</p> <p style="text-align: right;">e30bh071.10</p>
1	Wake-up happens when actual value exceeds the limit.	The limit defined with parameter ID 1018 is in percent of the maximum actual value.	<p>Actual value signal</p> <p>100%</p> <p>Par. ID1018=60%</p> <p>t</p> <p>Start Stop</p> <p style="text-align: right;">e30bh072.10</p>



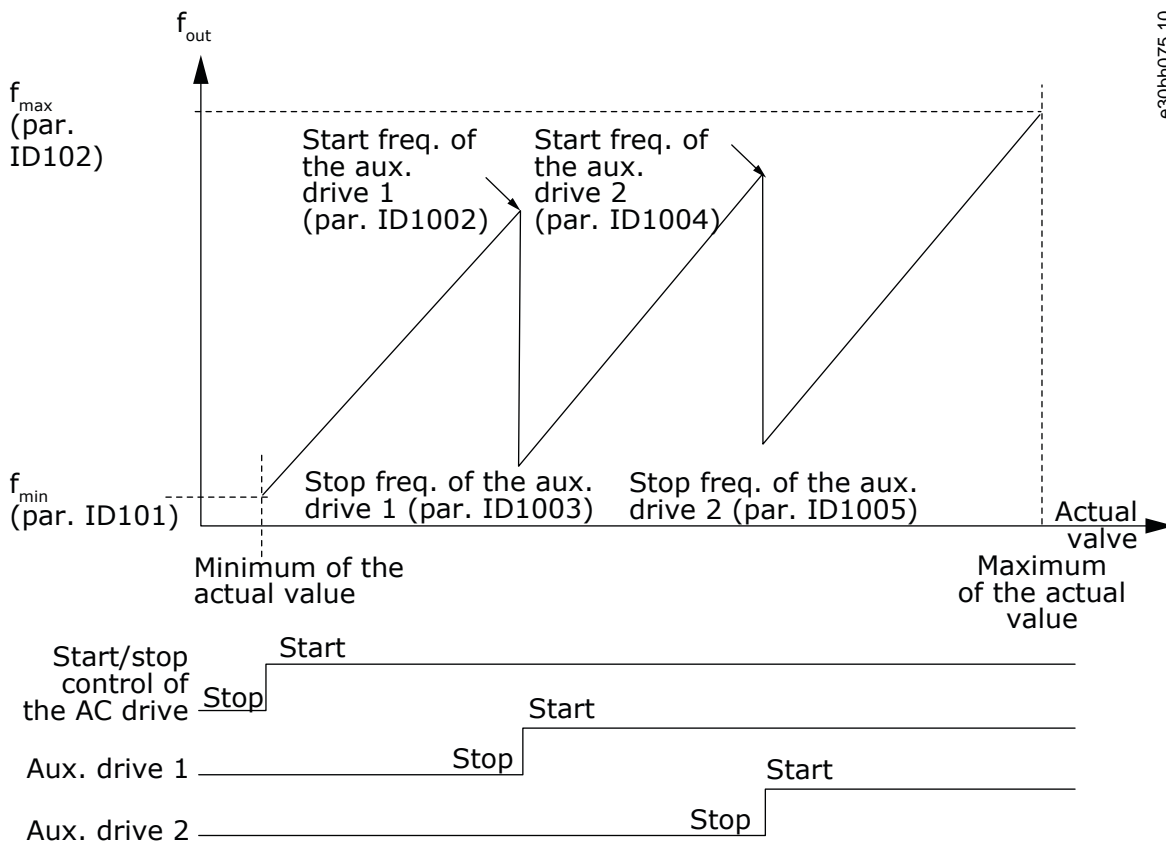
Selection number	Function	Limit	Description
2	Wake up happens when actual value goes below the limit.	The limit defined with parameter ID 1018 is in percent of the current value of the reference signal.	<p>Actual value signal</p> <p>100%</p> <p>reference=50%</p> <p>Par. ID1018=60%</p> <p>limit=60%*reference=30%</p> <p>t</p> <p>Start</p> <p>Stop</p> <p style="text-align: right;">e30bh0730.10</p>
3	Wake up happens when actual value exceeds the limit.	The limit defined with parameter ID 1018 is in percent of the current value of the reference signal.	<p>Actual value signal</p> <p>100%</p> <p>Par. ID1018=140%</p> <p>limit=140%*reference=70%</p> <p>reference=50%</p> <p>t</p> <p>Start</p> <p>Stop</p> <p style="text-align: right;">e30bh074.10</p>

### 10.421 (ID 1020) PID Controller Bypass

Location in the menu: **P2.9.16** (Pump and Fan Control Application)

Use this parameter to select if the PID controller is bypassed.

Then the frequency of the controlled drive and the starting points of the auxiliary drives are defined according to the actual value signal.



e30bh075.10

Illustration 91: Example of Variable Speed Drive and Two Auxiliary Drives with Bypassed PID Controller

### 10.422 (ID 1021) Analog Input Selection for Input Pressure Measurement

Location in the menu: P2.9.17 (Pump and Fan Control Application)

Use this parameter to select the analog input signal for which to set the input pressure measurement.

### 10.423 (ID 1022) Input Pressure High Limit

Location in the menu: P2.9.18 (Pump and Fan Control Application)

Use this parameter to set the high limit for the analog input selected for the input pressure measurement.

### 10.424 (ID 1023) Input Pressure Low Limit

Location in the menu: P2.9.19 (Pump and Fan Control Application)

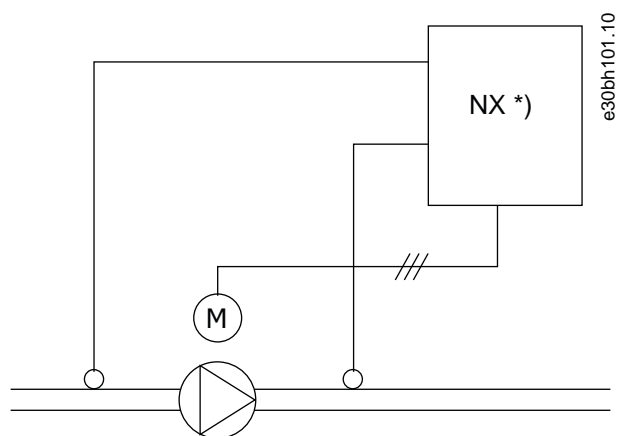
Use this parameter to set the low limit for the analog input selected for the input pressure measurement.

### 10.425 (ID 1024) Output Pressure Drop

Location in the menu: **P2.9.20** (Pump and Fan Control Application)

Use this parameter to set the decrease in output pressure when the input pressure goes below the input pressure low limit.

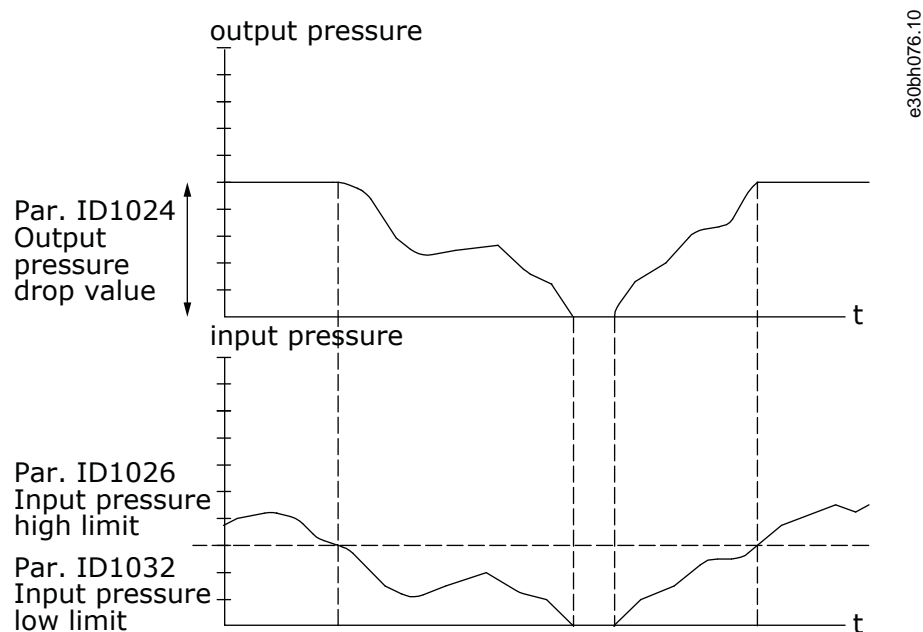
In pressure increase stations, decreasing of the output pressure can be needed if the input pressure decreases below a certain limit. The input pressure measurement which is needed is connected to the analog input selected with parameter *ID 1021*.



- \* • Input pressure measurement selected with parameter *ID 1021*
- PI-controller actual value input parameter *ID 333*

**Illustration 92: Input and Output Pressure Measuring**

With parameters *ID 1022* and *ID 1023* the limits for the area of the input pressure, where the output pressure is decreased, can be selected. The values are in percent of the input pressure measurement maximum value. With parameter *ID 1024*, the value for the output pressure decrease within this area can be set. The value is in percent of the reference value maximum.



e30bh076.10

Illustration 93: Output Pressure Behavior Depending on Input Pressure and Parameter Settings

#### 10.426 (ID 1025) Frequency Drop Delay

Location in the menu: **P2.9.21** (Pump and Fan Control Application)

Use this parameter to set the delay time after which the frequency is decreased after the auxiliary drive is started.

See [10.427 \(ID 1026\) Frequency Increase Delay](#).

#### 10.427 (ID 1026) Frequency Increase Delay

Location in the menu: **P2.9.22** (Pump and Fan Control Application)

Use this parameter to set the delay time after which the frequency is increased after the auxiliary drive is stopped.

If the speed of auxiliary drive increases slowly (for example, in soft starter control), a delay between the start of auxiliary drive and the frequency drop of the variable speed drive makes the control smoother. This delay can be adjusted with parameter *ID 1025*.

Similarly, if the speed of the auxiliary drives decreases slowly, a delay between the auxiliary drive stop and the frequency increase of the variable speed drive can be programmed with parameter *ID 1026*.

If either of the values of parameters *ID 1025* and *ID 1026* is set to maximum (300.0 s), no frequency drop nor increase takes place.

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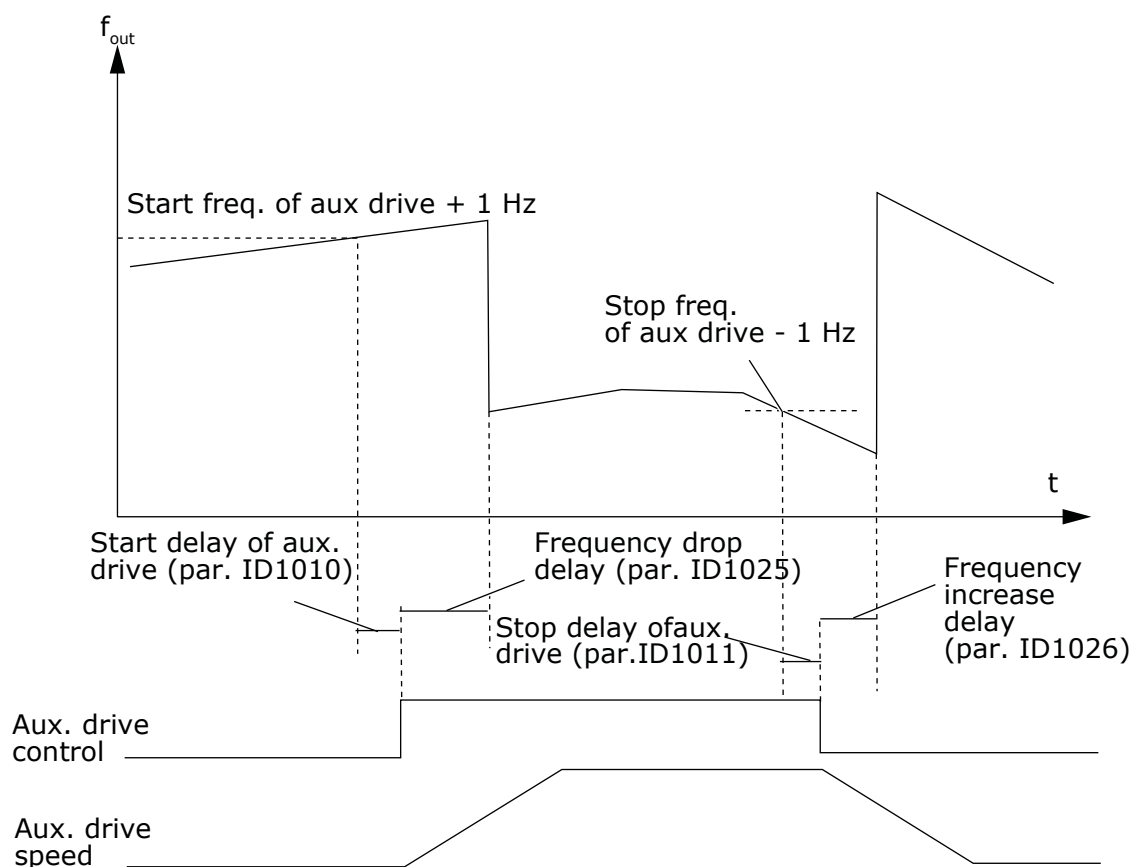


Illustration 94: Frequency Drop and Increase Delays

### 10.428 (ID 1027) Autochange

Location in the menu: **P2.9.24** (Pump and Fan Control Application)

Use this parameter to enable or disable the rotation of the start sequence and the priority of motors.

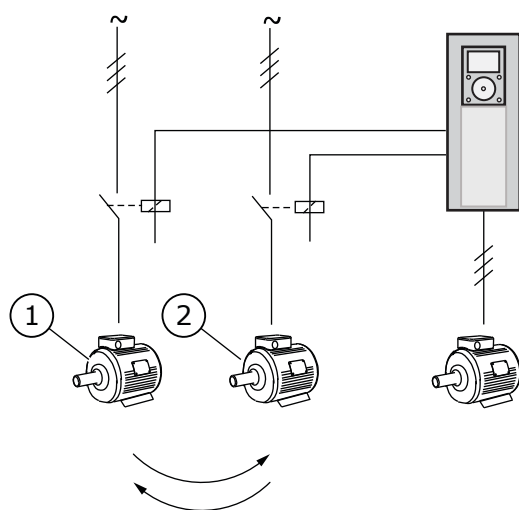
The automatic change of starting and stopping order is activated and applied to either the auxiliary drives only or the auxiliary drives and the drive controlled by the AC drive depending on the setting of parameter *ID 1028*, Automatics selection. By default, the Autochange is activated for 2 drives. See [illustration 20](#) and [10.530.2 Pump and Fan Automatics with Interlocks and Autochange](#).

### 10.429 (ID 1028) Autochange and Interlock Automatics Selection

Location in the menu: **P2.9.25** (Pump and Fan Control Application)

Use this parameter to select whether the autochange is applied to the auxiliary drives or all drives.

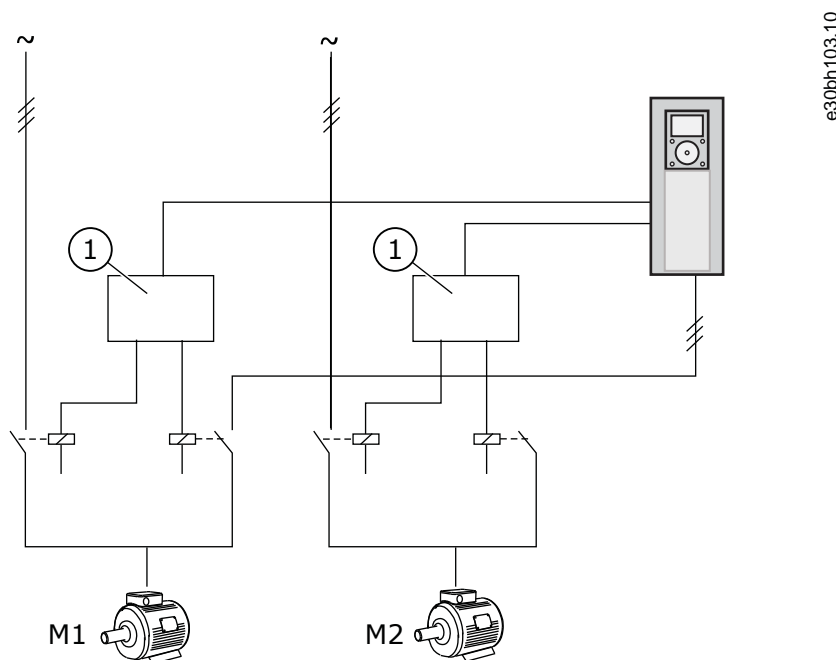
Selection number	Selection name	Description
0	Automatics (autochange/interlockings) applied to auxiliary drives only	The drive controlled by the AC drive remains the same. Only the mains contactor is needed for each drive. See <a href="#">illustration 95</a> .
1	All drives included in the autochange/interlockings sequence	The drive controlled by the AC drive is included in the automatics and two contactors are needed for each drive to connect it to the mains or the AC drive. See <a href="#">illustration 96</a> .



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1 Motor aux. 1	2 Motor aux. 2
----------------	----------------

Illustration 95: Autochange Applied to Auxiliary Drives Only



1 Auxiliary connection

Illustration 96: Autochange with All Drives

### 10.430 (ID 1029) Autochange Interval

Location in the menu: **P2.9.26** (Pump and Fan Control Application)

Use this parameter to adjust the autochange intervals.

When this time is over, the autochange occurs if the capacity is below the level set with parameters *ID 1031* (Autochange frequency limit) and *ID 1030* (Maximum number of auxiliary drives). If the capacity exceeds the value of *ID 1031*, the autochange does not take place before the capacity goes below this limit.

The time count is activated only if the Start/Stop request is active.

The time count is reset after the autochange has taken place.

See [10.432 \(ID 1031\) Autochange Frequency Limit](#).

### 10.431 (ID 1030) Maximum Number of Auxiliary Drives

Location in the menu: **P2.9.27** (Pump and Fan Control Application)

Use this parameter to set the number of auxiliary drives used.

See [10.432 \(ID 1031\) Autochange Frequency Limit](#).

### 10.432 (ID 1031) Autochange Frequency Limit

Location in the menu: **P2.9.28** (Pump and Fan Control Application)

Use this parameter to set the autochange frequency limit.

These parameters define the level below which the capacity used must remain so that the autochange can take place.

This level is defined as follows:

- If the number of running auxiliary drives is smaller than the value of parameter *ID 1030*, the autochange function can take place.
- If the number of running auxiliary drives is equal to the value of parameter *ID 1030* and the frequency of the controlled drive is below the value of parameter *ID 1031*, the autochange can take place.
- If the value of parameter *ID 1031* is 0.0 Hz, the autochange can take place only in rest position (Stop and Sleep) regardless of the value of parameter *ID 1030*.

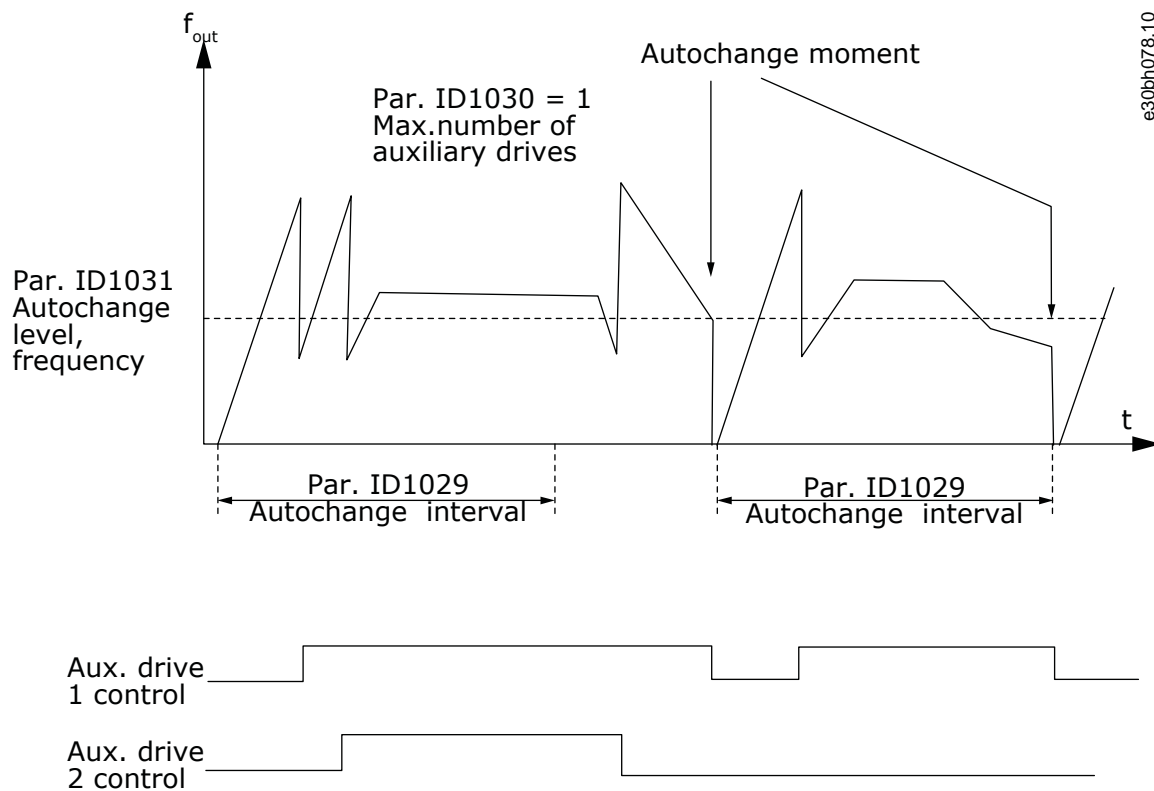


Illustration 97: Autochange Interval and Limits

### 10.433 (ID 1032) Interlock Selection

Location in the menu: **P2.9.23** (Pump and Fan Control Application)

Use this parameter to enable or disable the interlocks.

The interlock feedback signals come from the switches that connect the motors to the automatic control (AC drive), directly to the mains or place them to off-state. The interlock feedback functions are connected to the digital inputs of the AC drive. Program parameters *ID 426* to *ID 430* to connect the feedback functions to the digital inputs. Each drive must be connected to its own interlock input. The Pump and fan control controls only those motors whose interlock input is active.



Selection number	Selection name	Description
0	Interlock feedback not used	The AC drive receives no interlock feedback from the drives.
1	Update of autochange order in Stop	<p>The AC drive receives interlock feedback from the drives. In case one of the drives is, for some reason, disconnected from the system and eventually reconnected, it is placed last in the autochange line without stopping the system. However, if the autochange order now becomes, for example, [P1 -&gt; P3 -&gt; P4 -&gt; P2], it is updated in the next Stop (autochange, sleep, stop).</p> <p>Example: [P1-&gt; P3 -&gt; P4] -&gt; [P2 LOCKED] -&gt; [P1 -&gt; P3 -&gt; P4 -&gt; P2] -&gt; [SLEEP] -&gt; [P1 -&gt; P2 -&gt; P3 -&gt; P4]</p>
2	Update of order immediately	<p>The AC drive receives interlock feedback from the drives. At reconnection of a drive to the autochange line, the automatics stop all motors immediately and restart with a new set-up.</p> <p>Example: [P1 -&gt; P2 -&gt; P4] -&gt; [P3 LOCKED] -&gt; [STOP] -&gt; [P1 -&gt; P2 -&gt; P3 -&gt; P4]</p>

#### 10.434 (ID 1033) Actual Value Special Display Minimum

Location in the menu:

- **P2.2.46** (PID Control Application)
- **P2.9.29** (Pump and Fan Control Application)

Use this parameter to set the minimum value of the special display.

See [10.437 \(ID 1036\) Actual Value Special Display Unit](#).

#### 10.435 (ID 1034) Actual Value Special Display Maximum

Location in the menu:

- **P2.2.47** (PID Control Application)
- **P2.9.30** (Pump and Fan Control Application)

Use this parameter to set the maximum value of the special display.

See [10.437 \(ID 1036\) Actual Value Special Display Unit](#).

#### 10.436 (ID 1035) Actual Value Special Display Decimals

Location in the menu:

- **P2.2.48** (PID Control Application)
- **P2.9.31** (Pump and Fan Control Application)

Use this parameter to set the decimals of the special display.

See [10.437 \(ID 1036\) Actual Value Special Display Unit](#).

## 10.437 (ID 1036) Actual Value Special Display Unit

Location in the menu:

- **P2.2.49** (PID Control Application)
- **P2.9.32** (Pump and Fan Control Application)

Use this parameter to select the unit of the special display.

The Actual value special display parameters are used to convert and show the actual value signal in a form more informative to the user. The Actual value special display parameters are available in PID Control Application and Pump and Fan Control Application.

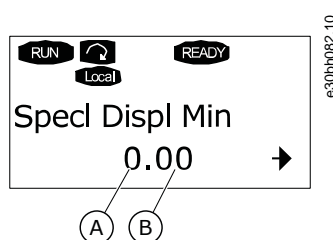
The following units can be selected (parameter *ID 1036*):

Value	Unit	On keypad
0	Not used	
1	%	%
2	°C	°C
3	m	m
4	bar	bar
5	mbar	mbar
6	Pa	Pa
7	kPa	kPa
8	PSI	PSI
9	m/s	m/s
10	l/s	l/s
11	l/min	l/m
12	l/h	l/h
13	m <sup>3</sup> /s	m <sup>3</sup> /s
14	m <sup>3</sup> /min	m <sup>3</sup> /m
15	m <sup>3</sup> /h	m <sup>3</sup> /h
16	°F	°F
17	ft	ft
18	gal/s	GPS
19	gal/min	GPM
20	gal/h	GPH
21	ft <sup>3</sup> /s	CFS
22	ft <sup>3</sup> /min	CFM
23	ft <sup>3</sup> /h	CFH
24	A	A
25	V	V
26	W	W

Value	Unit	On keypad
27	kW	kW
28	Hp	Hp
29 <sup>(1)</sup>	Inch	Inch

<sup>1</sup> Valid only for PID Control Application.

The maximum number of characters that can be shown on keypad is 4. Thus, sometimes the display of the unit on the keypad does not comply with the standards.



<b>A</b> Actual value minimum (maximum)	<b>B</b> Number of decimals
---	-----------------------------

Illustration 98: Display Example

**Example:**

The actual value signal sent from a sensor (in mA) tells the amount of waste water pumped from a tank per second. The signal range is 0(4)-20 mA. Instead of receiving the level of the actual value signal (in mA) on the display, you wish to receive the amount of water pumped in m3/s. Then set a value for parameter ID 1033 to correspond to the minimum signal level (0/4 mA) and another value for parameter ID 1034 to correspond to the maximum signal level (20 mA). The number of decimals needed can be set with parameter ID 1035 and the unit (m3/s) with parameter ID 1036. The level of the actual value signal is then scaled between the set minimum and maximum values and showed in the selected unit.

### 10.438 (ID 1080) DC-Brake Current at Stop

Location in the menu: P2.4.14 (Multi-purpose Control Application)

Use this parameter to set the current fed to the motor in stop state when the DC brake is active.

In the Multi-Purpose Control application, this parameter defines the current injected to the motor in stop state when parameter ID 416 is active. In all other applications, this value is fixed to a tenth of the DC brake current.

The parameter is available for VACON® NXP drives only.

### 10.439 (ID 1081) Follower Reference Selection

Location in the menu: P2.11.3 (Multi-purpose Control Application)

Use this parameter to select the speed reference to the follower drive.

Selection number	Function	Description
0	Analog input 1 (AI1)	See ID 377.
1	Analog input 2 (AI2)	See ID 388.
2	AI1+AI2	
3	AI1–AI2	
4	AI2–AI1	
5	AI1*AI2	
6	AI1 joystick	
7	AI2 joystick	
8	Keypad reference (R3.2)	
9	Fieldbus reference	
10	Potentiometer reference; controlled with ID 418 (TRUE=increase) and ID 417 (TRUE=decrease).	
11	AI1 or AI2, whichever is lower.	
12	AI1 or AI2, whichever is greater.	
13	Max. frequency ID 102 (recommended in torque control only)	
14	AI1/AI2 selection	See ID 422.
15	Encoder 1 (AI input C.1)	
16	Encoder 2 (With OPTA7 Speed Synchronization, VACON® NXP only AI input C.3)	
17	Master Reference	
18	Master Ramp Out (default)	

#### 10.440 (ID 1082) SystemBus Communication Fault Response

Location in the menu: **P2.7.30** (Multi-purpose Control Application)

Use this parameter to select the response of the drive to an 'SystemBus communication'.

#### 10.441 (ID 1083) Follower Torque Reference Selection

Location in the menu: **P2.11.4** (Multi-purpose Control Application)

Use this parameter to select the torque reference for the follower drive.

### 10.442 (ID 1084) Control Options

Location in the menu: **P2.4.19** (Multi-purpose Control Application)

Use this parameter to select the control option.

The parameter is available for VACON® NXP drives only.

Selection number	Selection name
b0	Disables encoder fault
b1	Update Ramp Generator when MotorControlMode changes from TC (4) to SC (3)
b2	RampUp; use acceleration ramp (for Closed Loop torque control)
b3	RampDown; use deceleration ramp (for Closed Loop torque control)
b4	FollowActual; follow actual speed value within WindowPos/ NegWidth (for closed loop torque control).
b5	TC ForceRampStop; Under stop request, the speed limit forces the motor to stop.
b6	Reserved
b7	Disables switching frequency decrease
b8	Disable the parameter "Run state parameter lock".
b9	Reserved
b10	Invert delayed digital output 1.
b11	Invert delayed digital output 2.

### 10.443 (ID 1085) Brake Current Limit

Location in the menu: **P2.3.4.16** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the brake current limit. The Mechanical brake closes immediately if the motor current is below the limit set in parameter Brake Current Limit.

### 10.444 (ID 1087) Scaling of Generating Torque Limit

Location in the menu: **P2.2.6.6** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to select the analog input signal that adjusts the maximum motor generating torque.

This signal adjusts the maximum motor generating torque between 0 and maximum limit set with parameter *ID 1288*. Analog input level zero equals zero generator torque limit.

### 10.445 (ID 1088) Scaling of Generating Power Limit

Location in the menu: **P2.2.6.8** (Multi-purpose Control Application)

Use this parameter to select the analog input signal that adjusts the maximum motor generating power.

This signal adjusts the maximum motor generating power between 0 and maximum limit set with parameter *ID 1290*. This parameter is available for Closed Loop control mode only. Analog input level zero equals zero generator power limit.

#### 10.446 (ID 1089) Follower Stop Function

Location in the menu: **P2.11.2** (Multi-purpose Control Application)

Use this parameter to select how the follower drive stops.

Defines how the follower drive stops (when selected follower reference is not Master's ramp, parameter *ID 1081*, selection 18).

#### 10.447 (ID 1090) Reset Encoder Counter

Location in the menu: **P2.2.7.29** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to select the digital input signal that resets the monitoring values Shaft Angle and Shaft Rounds to zero.

See [7.4.1 Monitoring Values \(Control Panel: Menu M1\)](#).

#### 10.448 (ID 1092) Master Follower Mode 2

Location in the menu: **P2.2.7.31** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to select the digital input signal that activates the second Master Follower mode. Select the digital input to activate the second Master Follower mode selected by parameter *ID 1093*.

#### 10.449 (ID 1093) Master Follower Mode 2 Selection

Location in the menu: **P2.11.7** (Multi-purpose Control Application)

Use this parameter to select the Master Follower function.

Select Master Follower mode 2 that is used when the DI is activated. When Follower is selected, the Run Request command is monitored from Master and all other references are selectable by parameters.

#### 10.450 (ID 1209) Input Switch Acknowledgement

Location in the menu: **P2.2.7.32** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to select the digital input signal that acknowledges the status of the input switch.

The input switch is normally a switch fuse unit or main contactor with which the power is fed to the drive. If the input switch acknowledgement is missing, the drive trips at Input switch open fault (F64).

### 10.451 (ID 1210) External Brake Acknowledgement

Location in the menu: **P2.2.7.24** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to select the digital input signal that acknowledges the status of the external brake.

Connect this digital input signal to an auxiliary contact of the mechanical brake. If the brake opening command is given, but the contact of the brake feedback signal does not close in given time, a mechanical brake fault shows (fault code 58).

### 10.452 (ID 1213) Emergency Stop

Location in the menu: **P2.2.7.30** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to select the digital input signal that activates the emergency stop function.

This parameter indicates to the drive that the external emergency stop circuit has stopped the machine. Select the digital input to activate the emergency stop input to the drive. When the digital input is low, the drive stops as per the parameter definition of *ID 1276 Emergency stop mode* and indicates the warning code A63.

### 10.453 (ID 1217) ID Bit Free DO1

Location in the menu: **P2.3.1.6** (Multi-purpose Control Application)

Use this parameter to select the signal that controls the digital output.

Set the parameter in format xxxx.yy where xxxx is the ID number of a signal and yy is the bit number. For example, the value for DO control is 43.06. 43 is the ID number of Status Word. So the digital output is ON when bit number 06 of Status Word (ID number 43) that is, Run Enable is on.

### 10.454 (ID 1218) DC Ready Pulse

Location in the menu: **P2.3.3.29** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to select the digital input signal that enables charging of the inverter drive through an input switch.

Charge DC. Used to charge the inverter drive through an input switch. When the DC-link voltage is above the charging level, a 2 second pulse train is generated to close the input switch. The pulse train is OFF when the input switch acknowledgement goes high.

### 10.455 (ID 1239) Inching Reference 1

Location in the menu: **P2.4.15** (Multi-purpose Control Application)

Use this parameter to set the frequency references for the inching function.

### 10.456 (ID 1240) Inching Reference 2

Location in the menu: **P2.4.16** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the frequency references for the inching function.



### 10.457 (ID 1241) Speed Share

Location in the menu: **P2.11.5** (Multi-purpose Control Application)

Use this parameter to set extra scaling to the frequency reference.

Defines the percentage for final speed reference from received speed reference.

### 10.458 (ID 1244) Torque Reference Filter Time

Location in the menu: **P2.10.12** (Multi-purpose Control Application)

Use this parameter to set the filtering time for the final torque reference.

### 10.459 (ID 1248) Load Share

Location in the menu: **P2.11.6** (Multi-purpose Control Application)

Use this parameter to set extra scaling to the torque reference.

Defines the percentage for final torque reference from received torque reference.

### 10.460 (ID 1250) Flux Reference

Location in the menu: **P2.6.15.32** (Multi-purpose Control Application)

Use this parameter to set scaling to the magnetizing current of the motor.

### 10.461 (ID 1252) Speed Step

Location in the menu:

- **P2.6.15.1** (Standard Application, Local/Remote Control Application, Multi-step Speed Control Application, PID Control Application)
- **P2.6.18.23** (Multi-purpose Control Application, VACON® NXS)
- **P2.6.17.25** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to adjust the speed controller when VACON® NCDrive is used.

See closer VACON® NCDrive Tools: Step response. Use this tool to give a step value to speed reference after ramp control.

### 10.462 (ID 1253) Torque Step

Location in the menu:

- **P2.6.18.24** (Multi-purpose Control Application, VACON® NXS)
- **P2.6.17.26** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to adjust the torque controller when VACON® NCDrive is used.

See closer VACON® NCDrive Tools: Step response. Use this tool to give step to torque reference.

### 10.463 (ID 1257) Inching Ramp

Location in the menu: **P2.4.17** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the ramp time when inching is active.

### 10.464 (ID 1276) Emergency Stop Mode

Location in the menu: **P2.4.18** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to select how the drive stops when the emergency stop command is given from DI or Fieldbus. Defines the action after the IO emergency input goes low.

### 10.465 (ID 1278) Torque Speed Limit, Closed Loop

Location in the menu: **P2.10.11** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to select the output frequency limit mode for the torque control.

For the selection of this parameter in VACON® NXS drives, see *ID 644*.

### 10.466 (ID 1285) Positive Frequency Limit

Location in the menu: **P2.6.11** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the final frequency reference limit for the positive direction.

Maximum frequency limit for the drive.

### 10.467 (ID 1286) Negative Frequency Limit

Location in the menu: **P2.6.10** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the final frequency reference limit for the negative direction.

Minimum frequency limit for the drive.

### 10.468 (ID 1287) Motor Torque Limit

Location in the menu: **P2.6.13** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the maximum torque limit of the motoring side.

### 10.469 (ID 1288) Generator Torque Limit

Location in the menu: **P2.6.12** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the maximum torque limit of the generating side.

### 10.470 (ID 1289) Motor Power Limit

Location in the menu: **P2.6.15.20** (Multi-purpose Control Application)

Use this parameter to set the maximum power limit of the motoring side.

For Closed Loop control mode only.

### 10.471 (ID 1290) Generator Power Limit

Location in the menu: **P2.6.15.19** (Multi-purpose Control Application)

Use this parameter to set the maximum power limit of the generating side.

For Closed Loop control mode only.

### 10.472 (ID 1316) Response to Brake Fault

Location in the menu: **P2.7.28** (Multi-purpose Control Application)

Use this parameter to set the response type to a brake fault.

### 10.473 (ID 1317) Brake Fault Delays

Location in the menu: **P2.7.29** (Multi-purpose Control Application)

Use this parameter to set the delay after which the brake fault is activated when there is a mechanical delay in the brake.

See parameter *ID 1210*.

### 10.474 (ID 1324) Master/Follower Selection

Location in the menu: **P2.11.1** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to select the Master/Follower mode.

When the value Follower is selected, the Run Request command is monitored from Master. All other references are selectable by parameters.

### 10.475 (ID 1352) SystemBus Fault Delay

Location in the menu: **P2.7.31** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the maximum time for which the heartbeat is missing before a SystemBus fault occurs.

#### 10.476 (ID 1355) Flux 10%

Location in the menu:

- **P2.6.18.1** (Multi-purpose Control Application, VACON® NXS)
- **P2.6.17.1** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the level of flux as a percentage of the nominal flux voltage.

Motor voltage corresponding to 10% of flux as a percentage of nominal flux voltage.

#### 10.477 (ID 1356) Flux 20%

Location in the menu:

- **P2.6.18.2** (Multi-purpose Control Application, VACON® NXS)
- **P2.6.17.2** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the level of flux as a percentage of the nominal flux voltage.

Motor voltage corresponding to 20% of flux as a percentage of nominal flux voltage.

#### 10.478 (ID 1357) Flux 30%

Location in the menu:

- **P2.6.18.3** (Multi-purpose Control Application, VACON® NXS)
- **P2.6.17.3** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the level of flux as a percentage of the nominal flux voltage.

Motor voltage corresponding to 30% of flux as a percentage of nominal flux voltage.

#### 10.479 (ID 1358) Flux 40%

Location in the menu:

- **P2.6.18.4** (Multi-purpose Control Application, VACON® NXS)
- **P2.6.17.4** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the level of flux as a percentage of the nominal flux voltage.

Motor voltage corresponding to 40% of flux as a percentage of nominal flux voltage.

#### 10.480 (ID 1359) Flux 50%

Location in the menu:

- **P2.6.18.5** (Multi-purpose Control Application, VACON® NXS)
- **P2.6.17.5** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the level of flux as a percentage of the nominal flux voltage.

Motor voltage corresponding to 50% of flux as a percentage of nominal flux voltage.

#### 10.481 (ID 1360) Flux 60%

Location in the menu:

- **P2.6.18.6** (Multi-purpose Control Application, VACON® NXS)
- **P2.6.17.6** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the level of flux as a percentage of the nominal flux voltage.

Motor voltage corresponding to 60% of flux as a percentage of nominal flux voltage.

#### 10.482 (ID 1361) Flux 70%

Location in the menu:

- **P2.6.18.7** (Multi-purpose Control Application, VACON® NXS)
- **P2.6.17.7** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the level of flux as a percentage of the nominal flux voltage.

Motor voltage corresponding to 70% of flux as a percentage of nominal flux voltage.

#### 10.483 (ID 1362) Flux 80%

Location in the menu:

- **P2.6.18.8** (Multi-purpose Control Application, VACON® NXS)
- **P2.6.17.8** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the level of flux as a percentage of the nominal flux voltage.

Motor voltage corresponding to 80% of flux as a percentage of nominal flux voltage.

#### 10.484 (ID 1363) Flux 90%

Location in the menu:

- **P2.6.18.9** (Multi-purpose Control Application, VACON® NXS)
- **P2.6.17.9** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the level of flux as a percentage of the nominal flux voltage.

Motor voltage corresponding to 90% of flux as a percentage of nominal flux voltage.

### 10.485 (ID 1364) Flux 100%

Location in the menu:

- **P2.6.18.10** (Multi-purpose Control Application, VACON® NXS)
- **P2.6.17.10** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the level of flux as a percentage of the nominal flux voltage.

Motor voltage corresponding to 100% of flux as a percentage of nominal flux voltage.

### 10.486 (ID 1365) Flux 110%

Location in the menu:

- **P2.6.18.11** (Multi-purpose Control Application, VACON® NXS)
- **P2.6.17.11** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the level of flux as a percentage of the nominal flux voltage.

Motor voltage corresponding to 110% of flux as a percentage of nominal flux voltage.

### 10.487 (ID 1366) Flux 120%

Location in the menu:

- **P2.6.18.12** (Multi-purpose Control Application, VACON® NXS)
- **P2.6.17.12** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the level of flux as a percentage of the nominal flux voltage.

Motor voltage corresponding to 120% of flux as a percentage of nominal flux voltage.

### 10.488 (ID 1367) Flux 130%

Location in the menu:

- **P2.6.18.13** (Multi-purpose Control Application, VACON® NXS)
- **P2.6.17.13** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the level of flux as a percentage of the nominal flux voltage.

Motor voltage corresponding to 130% of flux as a percentage of nominal flux voltage.

### 10.489 (ID 1368) Flux 140%

Location in the menu:

- **P2.6.18.14** (Multi-purpose Control Application, VACON® NXS)
- **P2.6.17.14** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the level of flux as a percentage of the nominal flux voltage.

Motor voltage corresponding to 140% of flux as a percentage of nominal flux voltage.

#### 10.490 (ID 1369) Flux 150%

Location in the menu:

- **P2.6.18.15** (Multi-purpose Control Application, VACON® NXS)
- **P2.6.17.15** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the level of flux as a percentage of the nominal flux voltage.

Motor voltage corresponding to 150% of flux as a percentage of nominal flux voltage.

#### 10.491 (ID 1385) ID Bit Free DO2

Location in the menu: **P2.3.2.6** (Multi-purpose Control Application)

Use this parameter to select the signal that controls the digital output.

Set the parameter in format *xxxx.yy* where *xxxx* is the ID number of a signal and *yy* is the bit number. For example, the value for DO control is 43.06. 43 is the ID number of Status Word. So the digital output is ON when bit number 06 of Status Word (ID number 43) that is, Run Enable is on.

#### 10.492 (ID 1401) Stop State Flux

Location in the menu: **P2.6.15.24** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the flux that is kept in the motor after the AC drive stops.

The flux is maintained for the time set by parameter *ID 1402*. This parameter can be used in closed loop motor control mode only.

#### 10.493 (ID 1402) Flux Off Delay

Location in the menu: **P2.6.15.23** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the time for how long the Stop State Flux is kept in the motor after the AC drive stops.

The flux defined by parameter *ID 1401* is maintained in the motor for the set time after the drive is stopped. This function is used to shorten the time before the full motor torque is available.

- 0 = No flux after the motor is stopped.
- >0 = The flux off delay in seconds.
- <0 = The flux is maintained in the motor after stop until the next Run request is given to the drive.

#### 10.494 (ID 1412) Torque Stabilator Gain

Location in the menu: **P2.6.18.1** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the gain of the torque stabilator in an open loop control operation.

Extra gain for the torque stabilizer at zero frequency.

#### 10.495 (ID 1413) Torque Stabilator Damping Time Constant

Location in the menu: **P2.6.18.2** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the damping time constant of the torque stabilizer.

The greater the parameter value, the shorter the time constant. If a PMS motor is used in Open Loop control mode, it is recommended to use value 980 in this parameter instead of 1000.

#### 10.496 (ID 1414) Torque Stabilator Gain in Fieldweakening Point

Location in the menu: **P2.6.18.3** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the gain of the torque stabilator at field weakening point in an open loop control operation.

#### 10.497 (ID 1424) Restart Delay

Location in the menu: **P2.6.8** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the time delay during which the drive cannot be restarted after coast stop (flying start not in use).

The time can be set up to 60.000 s. The Closed Loop control mode uses a different delay.

This function is not available when flying start is selected for start function (*ID 505*).

#### 10.498 (ID 1516) Modulator Type

Location in the menu: **P2.4.20** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to select the modulator type.

Some operations require use of a software modulator.



Selection number	Selection name	Description
0	ASIC modulator	<p>A classical third harmonic injection. The spectrum is slightly better compared to the Software 1 modulator.</p> <p>An ASIC modulator cannot be used when using Drive- Synch or PMS motor with an incremental type encoder.</p>
1	Software Modulator 1	<p>Symmetric vector modulator with symmetrical zero vectors. Current distortion is less than with software modulator 2 when boosting is used.</p> <p>This selection is recommended for DriveSynch (Set by default when DS activated) and needed when using PMS motor with an incremental encoder.</p>

### 10.499 (ID 1536) Follower Fault

Location in the menu: **P2.11.8** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to select the response of the Master drive to a fault in any of the follower drives.

For diagnostic purposes, when one of the drives trips to fault the master drive sends a command to trigger Data Logger in all the drives.

### 10.500 (ID 1550) Flux Circle Stabilator Gain

Location in the menu: **P2.6.18.5** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the gain for the flux circle stabilizer.

Gain for flux circle stabilizer (0–32766).

### 10.501 (ID 1551) Flux Stabilator TC

Location in the menu: **P2.6.18.6** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the filter coefficient of the identification current stabilizer.

### 10.502 (ID 1552) Voltage Stabilator TC

Location in the menu: **P2.6.18.10** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the damping rate of the voltage stabilizer.

Damping rate of voltage stabilizer (0–1000).

### 10.503 (ID 1553) Voltage Stabilator Limit

Location in the menu: **P2.6.18.11** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the limits for the voltage stabilizer output.

This parameter sets the limits for the voltage stabilizer output that is, the maximum and the minimum value for the correction term *df* in *FreqScale*.

### 10.504 (ID 1566) Polarity Pulse Current

Location in the menu: **P2.6.16.5** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the current level for the polarity direction check of the magnet axis during the start angle identification.

Value 0 means that the internal current level is used, which is typically slightly higher than the normal identification current defined by *ID 1756*. Polarity direction check is seldom needed because the identification itself already gives the right direction. Hence usually, this function can be disabled by setting any negative parameter value, which is recommended especially when there are F1 faults during the identification.

### 10.505 (ID 1587) Invert Delayed DO1

Location in the menu: **P2.3.1.5** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to invert the delayed digital output signal.

Inverts delayed digital output signal 1.

### 10.506 (ID 1588) Invert Delayed DO2

Location in the menu: **P2.3.2.5** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to invert the delayed digital output signal.

Inverts delayed digital output signal 2.

### 10.507 (ID 1691) Start Angle ID Modified

Location in the menu: **P2.6.16.3** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to select the start angle identification when no absolute encoder or incremental encoder with z-pulse are used.

Identification for the start angle, that is, the rotor magnet axis position in respect to the stator U-phase magnet axis, is needed when no absolute encoder or incremental encoder with z-pulse are used. This function defines how the start angle identification is made in those cases. The identification time depends on the motor electrical characteristics but takes typically 50 ms-200 ms.

With absolute encoders, the start angle reads the angle value directly from the encoder. However, incremental encoder z-pulse is used automatically for synchronization when its position is defined different from zero in *ID 649*. Also for absolute encoders, *ID 649* must be different from zero. Otherwise it is interpreted that the encoder identification run has not been done and the running is prohibited except when the start angle identification bypasses the absolute channel.

ModulatorType (*ID 1516*) has to be > 0 to be able to use this function.

Selection number	Selection name	Description
0	Automatic	Decision to use start angle identification is made automatically based on the encoder type connected to the drive. It serves common cases. Supports: OPTA4, OPTA5, OPTA7, and OPTAE boards.
1	Forced	Bypasses the drive automatic logic and forces the start angle identification to be active. Can be used, for example, with absolute encoders to bypass absolute channel information and to use start angle identification instead.
2	On Power-up	As a default, start angle identification is repeated in every start if the identification is active. This setting will enable identification only in a first start after drive is powered up. In consecutive starts, angle is updated based on the encoder pulse count.
10	Disabled	Used when Z-pulse from encoder is used for start angle identification.

### 10.508 (ID 1693) I/F Current

Location in the menu: **P2.6.16.6** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to define the current level that is used when I/f control for PMS motors is enabled.

I/f Current parameter is used for several different purposes:

- **I/F Control**  
This parameter defines the current level during I/f control, in percent of the motor nominal current.
- **Zero Position with Incremental Encoder and Z-pulse**  
In closed loop control utilizing the encoder z-pulse, this parameter also defines the current level used in starting before the z-pulse is received to synchronize with.
- **DC Start Angle Identification**  
This parameter defines the DC Current level when Start Angle Identification Time is set greater than zero.

### 10.509 (ID 1720) Torque Stabilator Limit Ratio

Location in the menu: **P2.6.18.4** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set a limit to the torque stabilator output.

$ID\ 111 * ID\ 1720 = \text{Torque Stabilator Limit}$

### 10.510 (ID 1738) Voltage Stabilator Gain

Location in the menu: **P2.6.18.9** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the gain of the voltage stabilizer.

### 10.511 (ID 1756) Start Angle ID Current

Location in the menu: **P2.6.16.4** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the current level that is used in the start angle identification.

The correct level depends on the motor type used. In general, 50% of motor nominal current seems to be sufficient, but depending, for example, on the motor saturation level, higher current is possibly needed.

### 10.512 (ID 1790) I/f Control Limit

Location in the menu: **P2.6.16.7** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the frequency limit for the I/f control.

This parameter sets the frequency limit for I/f-control in per cent of the motor nominal frequency. I/f-control is used if the frequency is below this limit. The operation changes back to normal when the frequency is above this limit with 1 Hz hysteresis.

### 10.513 (ID 1796) Flux Stabilator Coefficient

Location in the menu: **P2.6.18.8** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the coefficient of the flux stabilizer for induction motors.

### 10.514 (ID 1797) Flux Stabilator Gain

Location in the menu: **P2.6.18.7** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the gain of the flux stabilizer for induction motors.

### 10.515 (ID 1801) FB Fault Preset Frequency

Location in the menu: **P2.7.40** (Multi-purpose Control Application, VACON® NXP)

Use this parameter to set the frequency reference for the fieldbus communication warning.

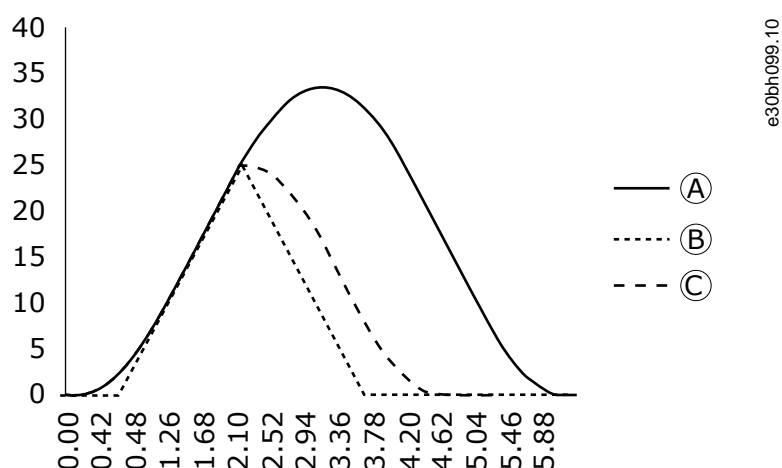
This parameter shows the frequency reference value to be used when fieldbus is the active control place, if fieldbus fault is active and the response to the fault (parameter *ID 733*) is set to 4 (Warn:PresetF).

### 10.516 (ID 1900) Ramp; Skip S2

Location in the menu: **P2.4.21** (Multi-purpose Control Application)

Use this parameter to bypass the second corner S-ramp.

This function is used to bypass the second corner S-ramp (that is, to avoid the unnecessary speed increase, shown with the solid line in [illustration 99](#)) when the reference is changed before the final speed is reached. Also S4 is bypassed when reference is increased while speed is ramping down.



A 10% S	B 0% S
C S2 Skip	

Illustration 99: Ramp; Skip S2

Second S curve is bypassed when reference changes at 25 Hz.

### 10.517 Keypad Control Parameters

Unlike the other parameters described in this manual, these parameters are located in the M3 menu of the control panel. The frequency and torque reference parameters do not have an ID number.

#### 10.517.1 (ID 114) Stop Button Activated

Location in the menu:

- P3.4 (Basic Application, Standard Application, Local/Remote Control Application, Multi-Step Speed Control Application, PID Control Application, Multi-Purpose Control Application)
- P3.6 (Pump and Fan Control Application)

Use this parameter to enable the stop button on the keypad.

To make the Stop button a "hotspot" which always stops the drive regardless of the selected control place, give this parameter the value 1.

See also parameter ID 125.

#### 10.517.2 (ID 125) Control Place

Location in the menu: P3.1

Use this parameter to select the control place.

For more information, see the User manual product.

Pushing the Start button for 3 s selects the control panel as the active control place and copies the Run status information (Run/Stop, direction, and reference).

### 10.517.3 (ID 123) Keypad Direction

Location in the menu: **P3.3**

Use this parameter to set the rotation direction of the motor when the control place is keypad.

Selection Number	Selection Name	Description
0	Forward	The rotation of the motor is forward, when the keypad is the active control place.
1	Reverse	The rotation of the motor is reversed, when the keypad is the active control place.

For more information, see the User manual of the product.

### 10.517.4 R3.2 Keypad Reference

Location in the menu: **R3.2**

The frequency reference can be adjusted from the keypad with this parameter.

The output frequency can be copied as the keypad reference by pushing the Stop button for 3 s on any of the pages of menu *M3*. For more information, see the User Manual of the product.

### 10.517.5 (ID 167) PID Reference 1

Location in the menu: **P3.4** (PID Control Application, Pump and Fan Control Application)

Use this parameter to set the reference value of the PID controller.

The PID controller keypad reference can be set between 0–100%. This reference value is the active PID reference if parameter *ID 332* = 2.

### 10.517.6 (ID 168) PID Reference 2

Location in the menu: **P3.5** (PID Control Application, Pump and Fan Control Application)

Use this parameter to set the reference value of the PID controller.

The PID controller keypad reference 2 can be set between 0–100%. This reference is active if the DIN 5 function = 13 and the DIN 5 contact is closed.

### 10.517.7 R3.5 Torque Reference

Location in the menu: **R3.5** (Multi-Purpose Control Application)

Define here the torque reference within -300.0...300.0%.

### 10.518 Master/Follower Function

This function is only available for VACON® NXP.

The Master/Follower function is designed for applications in several VACON® NXP drives run the system and the motor shafts are coupled to each other via gearing, chain, belt and so on. We recommend using the Closed Loop control mode.

The external Start/Stop control signals are connected to the Master drive only. Speed and torque references and control modes are selected for each drive separately. The Master controls the Follower(s) via a SystemBus. The Master station is typically speed-controlled and the other drives follow its torque or speed reference.

Torque control of the Follower must be used when the motor shafts of the Master and Follower drives are solidly coupled to each other by, for example, gearing, or a chain. Thus, no speed difference between the drives is possible. Window control is recommended to keep the speed of the follower close to that of the master.

Speed control of the Follower must be used when the demand of speed accuracy is lower. In such cases, use of load drooping is recommended in all drives to balance the load.

#### Master/Follower Link Physical Connections

In [illustration 100](#), the master drive is on the left side and all others are followers. The master/follower physical link can be built with OPTD2 option board. See VACON® NX I/O Boards User Manual for further information.

#### Optical Fiber Connection between AC drives with OPTD2

The OPTD2 board in the Master has the default jumper selections, that is, X6:1–2, X5:1–2. For the followers, the jumper positions have to be changed: X6:1–2, X5:2–3. This board also has a CAN communication option that is useful for multiple-drive monitoring with VACON® NCDrive PC software, when commissioning Master Follower functions or line systems.

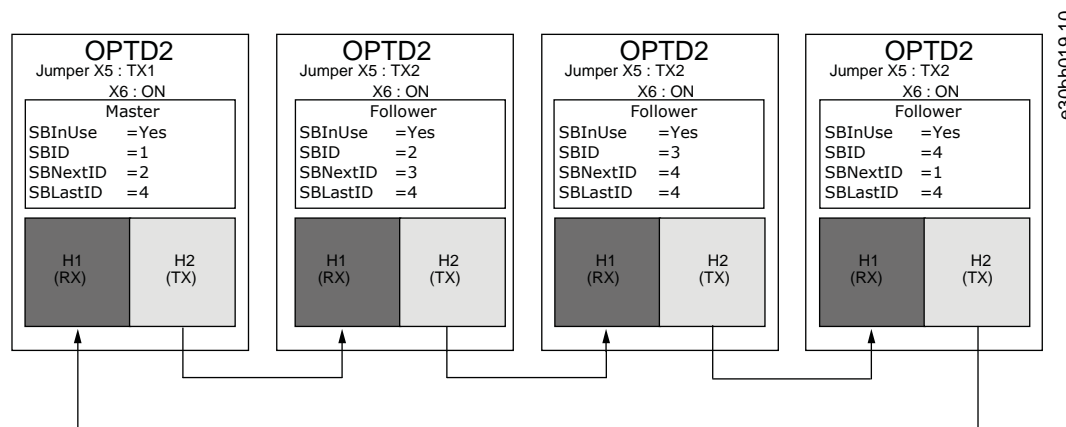


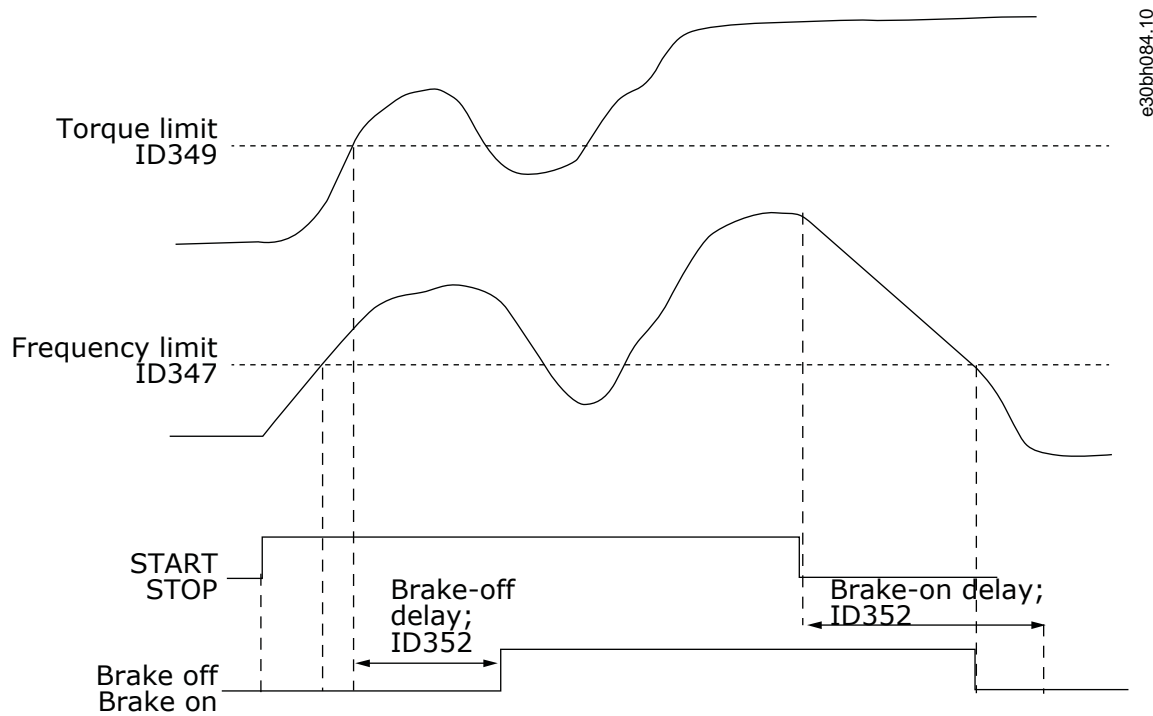
Illustration 100: System Bus Physical Connections with the OPTD2 Board

For information on the OPTD2 expander board parameters, see VACON® NX I/O Boards User Manual.

### 10.519 External Brake Control with Additional Limits (IDs 315, 316, 346–349, 352, 353)

The external brake used for extra braking can be controlled through parameters ID 315, ID 316, ID 346-349, and ID 352/ID 353. Selecting On/Off Control for the brake, defining the frequency or torque limit(s) the brake must react to and defining the Brake-On/-Off delays allow an effective brake control.

The brake control is disabled during Identification Run (see parameter *ID 631*).



**Illustration 101: Brake Control with Additional Limits**

In 21 above, the brake control is set to react to both the torque supervision limit (parameter *ID 349*) and frequency supervision limit (*ID 347*). Also, the same frequency limit is used for both brake-off and brake-on control by giving parameter *ID 346* the value 4. Use of two different frequency limits is also possible. Then parameters *ID 315* and *ID 346* must be given the value 3.

Brake-off: In order for the brake to release, three conditions must be fulfilled:

- drive must be in Run state
- the torque must be over the set limit (if used)
- the output frequency must be over the set limit (if used)

Brake-on: Stop command activates the brake delay count and the brake is closed when the output frequency falls below the set limit (*ID 315* or *ID 346*). As a precaution, the brake closes when the brake-on delay expires, at the latest.

A fault or Stop state closes the brake immediately without a delay.

It is recommended that the brake-on delay is set longer than the ramp time to avoid damaging of the brake.



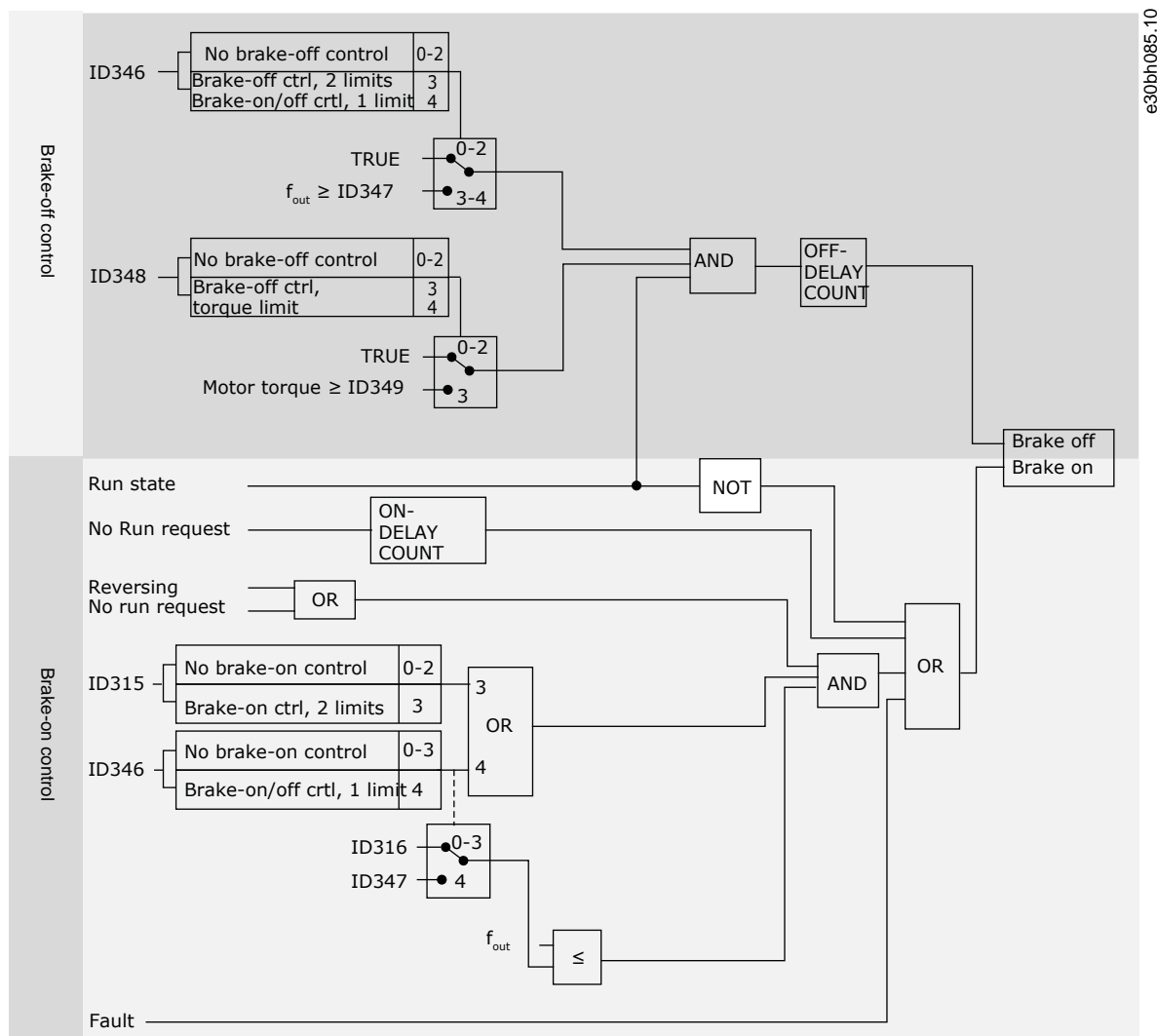


Illustration 102: Brake Control Logic

When using the Master Follower function, the follower drive opens the brake at the same time with the Master even if the Follower's conditions for brake opening have not been met.

### 10.520 Parameters of Motor Thermal Protection (IDs 704–708)

The motor thermal protection prevents the motor from becoming too hot.

The AC drive can supply a current that is higher than the nominal current. The high current can be necessary to the load, and it must be used. In these conditions, there is a risk of a thermal overload. Low frequencies have a higher risk. At low frequencies, the cooling effect and the capacity of the motor decrease. If the motor has an external fan, the load reduction at low frequencies is small.

The motor thermal protection is based on calculations. The protection function uses the output current of the drive to know what is the load on the motor. If the control board is not energized, the calculations are reset.

The motor thermal protection can be adjusted with parameters. The thermal current  $I_T$  specifies the load current above which the motor is overloaded. This current limit is a function of the output frequency.

The thermal stage of the motor can be monitored on the control panel display. See the User Manual of the product.

When using long motor cables (maximum 100 m) with small drives ( $\leq 1.5$  kW), the motor current that the drive measures can be much higher than the actual motor current. It is because there are capacitive currents in the motor cable.

## NOTICE

### MOTOR DAMAGE HAZARD

If the airflow is blocked, the function does not protect the motor, and the motor can become too hot.

- Make sure that the airflow to the motor is not blocked.

### 10.521 Parameters of Stall Protection (IDs 709–712)

The motor stall protection function gives protection to the motor against short overloads. An overload can be caused, for example, by a stalled shaft. It is possible to set the reaction time of the stall protection shorter than that of the motor thermal protection.

The stall status of the motor is specified with parameters *ID 710 (Stall current)* and *ID 712 (Stall frequency limit)*. If the current is higher than the limit, and the output frequency is lower than the limit, the motor is in a stall status.

The stall protection is a type of overcurrent protection.

When using long motor cables (maximum 100 m) with small drives ( $\leq 1.5$  kW), the motor current that the drive measures can be much higher than the actual motor current. It is because there are capacitive currents in the motor cable.

### 10.522 Parameters of Underload Protection (IDs 713–716)

The motor underload protection makes sure that there is a load on the motor when the drive operates. If the motor loses the load, a problem can occur in the process. For example, a belt can break or a pump become dry.

You can adjust the motor underload protection with parameters *ID 714 (Field Weakening Area Load)* and *ID 715 (Zero Frequency Load)*. The underload curve is a squared curve between the zero frequency and the field weakening point. The protection is not active below 5 Hz.

The underload time counter does not operate below 5 Hz. The values of the underload protection parameters are set in percentage of the nominal torque of the motor. To find the scaling ratio for the internal torque value, use the data in the nameplate data of the motor, the motor nominal current, and the nominal current of the drive  $I_H$ . When using another current than the nominal motor current, the precision of the calculation decreases.

When using long motor cables (maximum 100 m) with small drives ( $\leq 1.5$  kW), the motor current that the drive measures can be much higher than the actual motor current. It is because there are capacitive currents in the motor cable.

### 10.523 Fieldbus Control Parameters (IDs 850–859)

The Fieldbus control parameters are used when the frequency or the speed reference comes from the fieldbus (Modbus, PROFIBUS, DeviceNet, and so on). Use the Fieldbus Data Out Selection 1–8 to monitor values from the fieldbus.

### 10.523.1 Process Data Out (Slave -> Master)

The fieldbus master can read the actual values of the AC drive using process data variables. Basic, Standard, Local/Remote, Multi-Step, PID Control, and Pump and Fan Control Applications use process data as follows:

**Table 115: The Default Values for Process Data Out in Fieldbus**

Data	Default value	Unit	Scale	ID
Process Data Out 1	Output frequency	Hz	0.01 Hz	1
Process Data Out 2	Motor speed	RPM	1 RPM	2
Process Data Out 3	Motor current	A	0.1 A	45
Process Data Out 4	Motor torque	%	0.1%	4
Process Data Out 5	Motor power	%	0.1%	5
Process Data Out 6	Motor voltage	V	0.1 V	6
Process Data Out 7	DC-link voltage	V	1 V	7
Process Data Out 8	Active fault code	-	-	

The Multi-purpose Control Application has a selector parameter for every Process Data. The monitoring values and drive parameters can be selected using the ID number. Default selections are as in the table.

### 10.523.2 Current Scaling in Different Size of Units

Monitoring value *ID 45* (usually in Process data OUT3) is given with one decimal only.

**Table 116: Current Scaling in Different Size of Units**

Voltage (V AC)	Size	Scale
208–240	NX_2 0001–0011	100 – 0.01 A
208–240	NX_2 0012–0420	10 – 0.1 A
380–500	NX_5 0003–0007	100 – 0.01 A
380–500	NX_5 0009–0300	10 – 0.1 A
380–500	NX_5 0385 –	1–1 A
525–690	NX_6 0004–0013	100 – 0.01 A
525–690	NX_6 0018 –	10 – 0.1 A

### 10.523.3 Process Data in (Master -> Slave)

ControlWord, Reference, and Process Data are used in All in One applications as follows:

**Table 117: Basic, Standard, Local/Remote, Multi-Step Applications**

Data	Value	Unit	Scale
Reference	Speed reference	%	0.01%

Data	Value	Unit	Scale
ControlWord	Start/Stop command	-	-
	Fault reset command		
PD1 – PD8	Not used	-	-

The settings in [table 118](#) are factory defaults. See also parameter group G2.9.

**Table 118: Multi-Purpose Control Application**

Data	Value	Unit	Scale
Reference	Speed reference	%	0.01%
ControlWord	Start/Stop command	-	-
	Fault reset command		
Process Data IN1	Torque reference	%	0.01%
Process Data IN2	Free analog input	%	0.01%
Process Data IN3	Adjust input	%	0.01%
PD4 – PD8	Not used	-	-

**Table 119: PID Control and Pump and Fan Control Applications**

Data	Value	Unit	Scale
Reference	Speed reference	%	0.01%
ControlWord	Start/Stop command	-	-
	Fault reset command		
Process Data IN1	Reference for PID controller	%	0.01%
Process Data IN2	Actual value 1 to PID controller	%	0.01%
Process Data IN3	Actual value 2 to PID controller	%	0.01%
PD4 – PD8	Not used	-	-

## 10.524 Closed Loop Parameters (IDs 612–621)

Select the Closed loop control mode by setting value 3 or 4 for parameter *ID 600*.

Closed loop control mode (see [10.277 \(ID 600\) Motor Control Mode](#)) is used when enhanced performance near zero speed and better static speed accuracy with higher speeds are needed. Closed loop control mode is based on "rotor flux-oriented current vector control". With this controlling principle, the phase currents are divided into a torque producing current portion and a magnetizing current portion. Thus, the squirrel cage induction machine can be controlled in a fashion of a separately excited DC motor.

These parameters can be used with VACON® NXP drive only.

### Example:

Motor Control Mode = 3 (Closed loop speed control)

This mode is the usual operation mode when fast response times, high accuracy, or controlled run at zero frequencies are needed. Encoder board must be connected to slot C of the control unit. Set the encoder P/R-parameter (P7.3.1.1). Run in open loop and check the encoder speed and direction (V7.3.2.2). Switch the encoder wiring or the phases of motor cables if necessary. Do not run if encoder speed is wrong. Program the no-load current to parameter ID 612 or perform the ID run without load on motor shaft. Also, set parameter ID 619 (Slip Adjust) to get the voltage slightly above the linear U/f-curve with the motor frequency at about 66% of the nominal motor frequency. The Motor Nominal Speed parameter (ID 112) is critical. The Current Limit parameter (ID 107) controls the available torque linearly in relative to motor nominal current.

### 10.525 "Terminal to Function" (TTF) Programming Principle

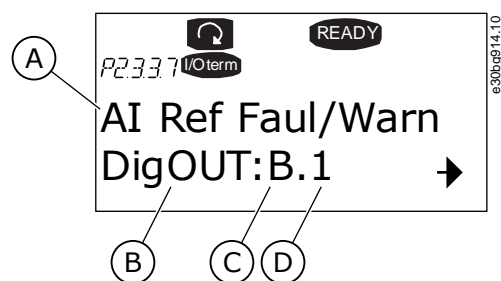
The programming principle of the input and output signals in the Multi-purpose Control Application as well as in the Pump and Fan Control Application (and partly in the other applications) is different compared to the conventional method used in other VACON® NX applications.

In the conventional programming method, Function to Terminal Programming Method (FTT), a certain function is defined for a fixed input or output. The applications mentioned, however, use the Terminal to Function Programming method (TTF) in which the programming process is carried out the other way round: Functions appear as parameters which the operator defines a certain input/output for. See the warning in [10.525.2 Defining a Terminal for a Certain Function with VACON® NCDrive](#).

#### 10.525.1 Defining an Input/Output for a Certain Function on Keypad

**Context:**

Connecting a certain input or output with a certain function (parameter) is done by giving the parameter an appropriate value. The value is formed of the Board slot on the VACON® NX control board (see the User Manual of the product) and the respective signal number.

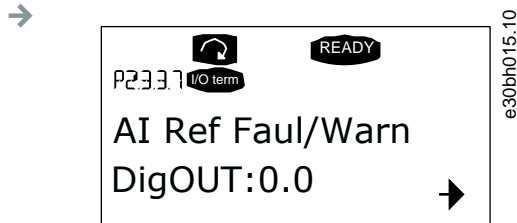


A	Function name	B	Terminal type
C	Slot	D	Terminal number

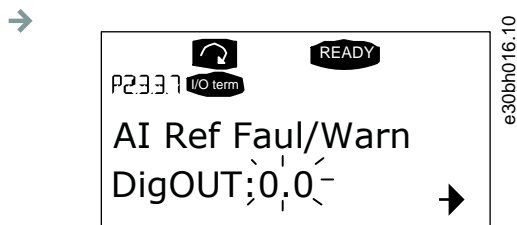
Illustration 103: Defining an Input/Output for a Certain Function on Keypad

**Procedure**

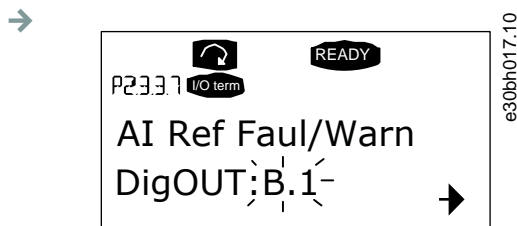
1. Find the parameter on the keypad. Press the Menu button right once to enter the edit mode. On the value line, see the terminal type on the left (DigIN, DigOUT, An.IN, An.OUT) and on the right, the present input/output the function is connected to (B.3, A.2, and so on), or if not connected, a value (0.#).



2. When the value is blinking, hold down the Browser button up or down to find the desired board slot and signal number. The program scrolls the board slots starting from 0 and proceeding from A to E and the I/O selection 1–10.



3. Once the desired value has been set, press the [enter] button once to confirm the change.



### 10.525.2 Defining a Terminal for a Certain Function with VACON® NCDriver

If using the VACON® NCDriver Programming Tool for parametrizing, the connection between the function and input/output must be established in the same way as with the control panel. Pick the address code from the drop-down menu in the *Value* column.

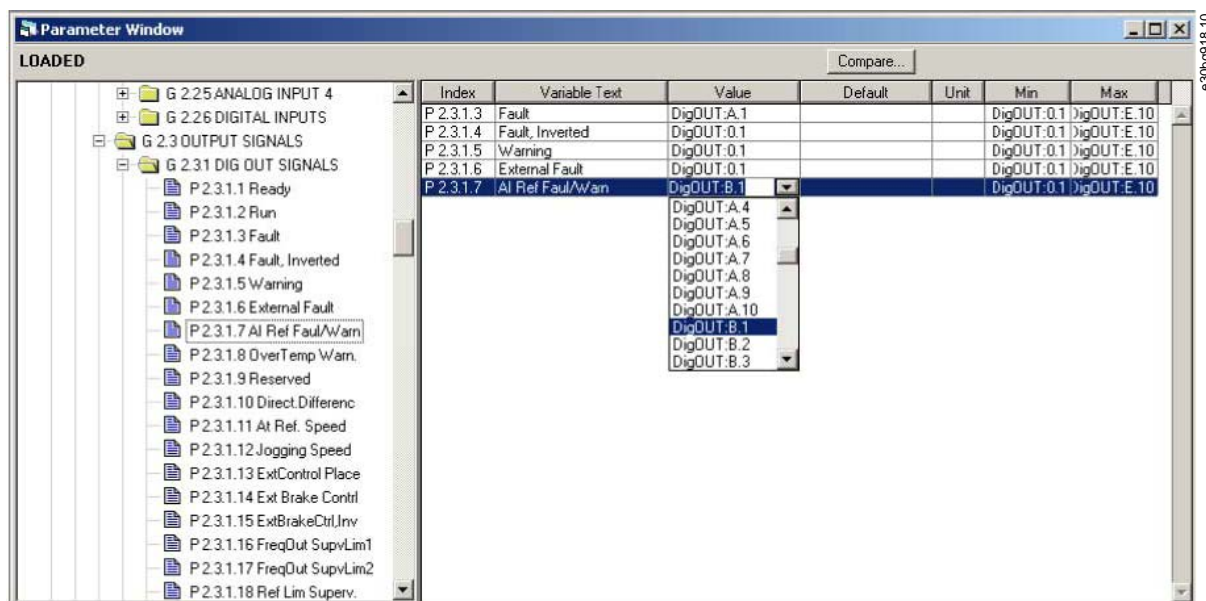


Illustration 107: Screenshot of the VACON® NCDrive Programming Tool; Entering the Address Code

**CAUTION**

**FUNCTION OVERRUNS**

Connecting two functions to one and same output in can cause function overruns.

- Do not to connect two functions to one and same output to avoid function overruns and to ensure flawless operation.

**NOTICE**

The inputs, unlike the outputs, cannot be changed in RUN state.

### 10.525.3 Defining Unused Inputs/Outputs

All unused inputs and outputs must be given the option slot value 0 and the value 1 also for the terminal number. The value 0.1 is also the default value for most of the functions. However, if, for example, the values of a digital input signal are used for testing purposes only, the option slot value can be set to 0 and the terminal number to any number between 2–10 to place the input to a TRUE state. In other words, the value 1 corresponds to 'open switch' and values 2–10 to 'closed switch'.

For analog inputs, giving the value 1 for the terminal number corresponds to 0% signal level, value 2 corresponds to 20%, value 3 to 30% and so on. Giving value 10 for the terminal number corresponds to 100% signal level.

### 10.526 Speed Control Parameters (Multi-Purpose Control Application Only)

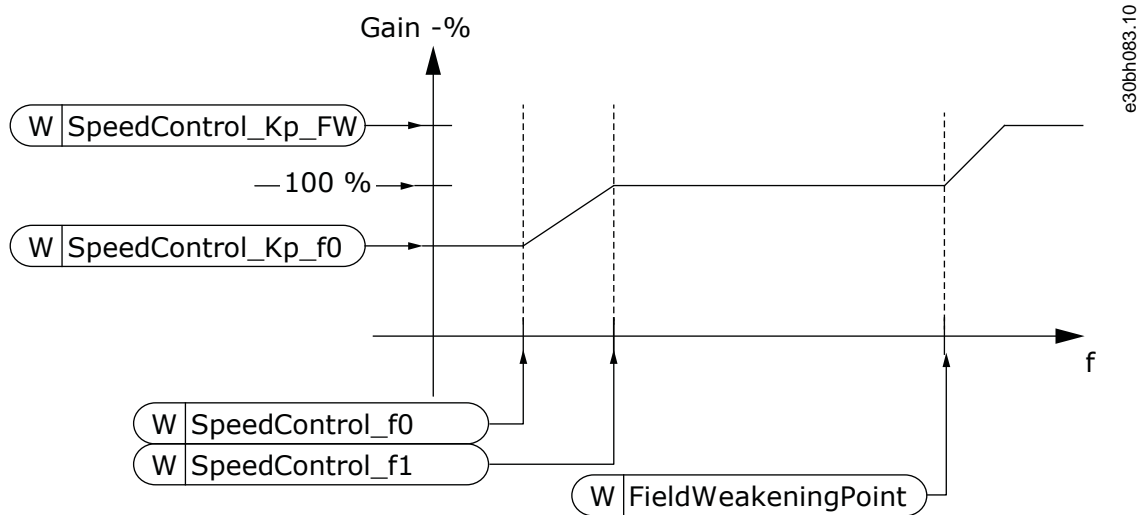


Illustration 108: Speed Controller Adaptive Gain

### 10.526.1 (ID 1295) Speed Controller Torque Minimum Gain

Location in the menu: **P2.6.15.30** (Multi-purpose Control Application)

Use this parameter to set the relative gain in percentage when the torque is below SPC Torque Minimum.

The relative gain as a percentage of *ID 613* of the speed controller when the torque reference or the speed control output is less than the value of parameter *ID 1296*. This parameter is normally used to stabilize the speed controller for a drive system with gear backlash.

### 10.526.2 (ID 1296) Speed Controller Torque Minimum

Location in the menu: **P2.6.15.29** (Multi-purpose Control Application)

Use this parameter to set the limit for the reduced speed controller gain.

The level of torque reference below which the speed controller gain is changed from *ID 613* to *ID 1295*. It is in percentage of motor nominal torque. The change is filtered according to parameter *ID 1297*.

### 10.526.3 (ID 1297) Speed Controller Torque Minimum Filtering Time

Location in the menu: **P2.6.15.31** (Multi-purpose Control Application)

Use this parameter to set the filtering time for speed controller gain.



Filtering time for torque when the speed controller gain is changed between *ID 613* and *ID 1295* depending on *ID 1296*.

#### 10.526.4 (ID 1298) Speed Controller Gain in Field Weakening Area

Location in the menu: **P2.6.15.28** (Multi-purpose Control Application)

Use this parameter to set the final gain for speed controller gain at field weakening point.

The relative gain of the speed controller in the field weakening area as a percentage of parameter *ID 613*.

#### 10.526.5 (ID 1299) Speed Controller Gain F0

Location in the menu: **P2.6.15.27** (Multi-purpose Control Application)

Use this parameter to set the relative gain in percentage below the speed controller F0 point.

The relative gain of the speed controller as a percentage of parameter *ID 613* when the speed is below the level defined by *ID 1300*.

#### 10.526.6 (ID 1300) Speed Controller F0 Point

Location in the menu: **P2.6.15.26** (Multi-purpose Control Application)

Use this parameter to set the speed level below which the speed controller gain is equal to speed controller gain F0.

The speed level in Hz below which the speed controller gain is equal to parameter *ID 1299*.

#### 10.526.7 (ID 1301) Speed Controller F1 Point

Location in the menu: **P2.6.15.25** (Multi-purpose Control Application)

Use this parameter to set the speed level above which the speed controller gain is equal to Speed control P gain.

The speed level in Hz above which the speed controller gain is equal to parameter *ID 613*. From the speed defined by parameter *ID 1300* to speed defined by parameter *ID 1301*, the speed controller gain changes linearly from parameters *ID 1299* to *ID 613* and the opposite way.

#### 10.526.8 (ID 1304) Window Positive

Location in the menu: **P2.10.14** (Multi-purpose Control Application)

Use this parameter to set the size of the window to the positive direction from the final speed reference.

#### 10.526.9 (ID 1305) Window Negative

Location in the menu: **P2.10.13** (Multi-purpose Control Application)

Use this parameter to set the size of the window to the negative direction from the final speed reference.

### 10.526.10 (ID 1306) Window Positive Off Limit

Location in the menu: **P2.10.16** (Multi-purpose Control Application)

Use this parameter to set the positive off limit to the speed controller when the speed comes back to the window.

### 10.526.11 (ID 1307) Window Negative Off Limit

Location in the menu: **P2.10.15** (Multi-purpose Control Application)

Use this parameter to set the negative off limit to the speed controller when the speed comes back to the window.

### 10.526.12 (ID 1311) Speed Error Filter TC

Location in the menu: **P2.6.15.33** (Multi-purpose Control Application)

Use this parameter to set the filtering time for the speed reference and the actual speed error.

Can be used to remove small disturbances in the encoder signal.

### 10.526.13 (ID 1382) Speed Control Output Limit

Location in the menu: **P2.10.17** (Multi-purpose Control Application)

Use this parameter to set a maximum torque limit for the speed controller output as a percentage of the motor nominal torque.

## 10.527 Functional Safety Parameters (Multi-Purpose Control Application Only)

### 10.527.1 (ID 542) Response to Safe Stop Request

Location in the menu: **P2.12.1** (Multi-purpose Control Application)

Use this parameter to set the action of the drive when a Safe Stop request becomes active on the safety option board.

With this setting, select whether:

- the drive is allowed to ramp down the speed of the motor or
- the upper control system responsible to ramp down the speed of the motor.

Selection number	Selection name	Description
0	No action	The drive does not react to the safe stop requests. Upper control system is responsible to ramp down the speed of the drive.
1	Stop, according to ramp 1.	Stop the drive by ramping. Deceleration ramp according to parameter P2.1.4 Decel Time 1.
2	Stop, according to ramp 2.	Stop the drive by ramping. Deceleration ramp according to parameter P2.4.4 Decel Time 2.
3	Stop, according to ramp configured to the safety option board.	Stop the drive by ramping. The drive uses a deceleration ramp which is an average value of min and max ramp times which are configured on the safety option board.

### 10.527.2 (ID 543) Response to Safe Limited Speed (SLS) Request

Location in the menu: P2.12.2 (Multi-purpose Control Application)

Use this parameter to set the action of the drive when an SLS request becomes active on the safety option board.

With this setting, select whether:

- the drive is allowed to limit and decelerate the speed of the motor
- the upper control system responsible to limit and decelerate the speed of the motor.

Selection number	Selection name	Description
0	No action	The drive does not react to the SLS requests. Upper control system is responsible to limit and decelerate the speed of the drive.
1	Limit the speed reference, decelerate according to ramp 1.	The speed reference of the drive is limited to the value that is 95% of the requested SLS speed limit. Deceleration ramp according to parameter P2.1.4 Decel Time 1.
2	Limit the speed reference, decelerate according to ramp 2.	The speed reference of the drive is limited to the value that is 95% of the requested SLS speed limit. Deceleration ramp according to parameter P2.4.4 Decel Time 2.
3	Limit the speed reference, decelerate according to the ramp configured to the safety option board.	The speed reference of the drive is limited to the value that is 95% of the requested SLS speed limit. The drive uses deceleration ramp which is an average value of the min and max ramp times which are configured to the safety option board.

### 10.527.3 (ID 544) Response to Safe Direction (SDI) Request

Location in the menu: P2.12.3 (Multi-purpose Control Application)

Use this parameter to set the action of the drive when a SDI request becomes active on the safety option board.

With this setting, select whether:

- the drive is allowed to prohibit the speed reference on unintended direction
- the upper control system responsible prohibits speed reference on unintended direction.

Selection number	Selection name	Description
0	No action	The drive does not react to the SDI requests. Upper control system is responsible to prohibit the speed reference on unintended direction.
1	Prohibit the speed reference on unintended direction.	The speed reference of the drive is prohibited on unintended direction.

### 10.528 Automatic Changing Between Drives (Pump and Fan Control Application Only)

The Autochange function allows the starting and stopping order of drives controlled by the pump and fan automatics to be changed at desired intervals. The drive controlled by AC drive can be also included in the automatic changing and locking sequence (*ID 1028*). The Autochange function makes it possible to equalize the run-times of the motors and to prevent, for example, pump stalls due to too long running breaks.

- Apply the Autochange function with parameter *ID 1027, Autochange*.
- The autochange takes place when the time set with parameter *ID 1029, Autochange interval*, has expired and the capacity used is below the level defined with parameter *ID 1031, Autochange frequency limit*.
- The running drives are stopped and restarted according to the new order.
- External contactors controlled through the relay outputs of the AC drive connect the drives to the AC drive or to the mains. If the motor controlled by the AC drive is included in the autochange sequence, it is always controlled through the relay output activated first. The other relays activated later control the auxiliary drives (see [illustration 110](#) and [illustration 111](#)).

See the following parameter descriptions:

- [10.428 \(ID 1027\) Autochange](#)
- [10.429 \(ID 1028\) Autochange and Interlock Automatics Selection](#)
- [10.430 \(ID 1029\) Autochange Interval](#)
- [10.431 \(ID 1030\) Maximum Number of Auxiliary Drives](#)
- [10.432 \(ID 1031\) Autochange Frequency Limit](#)

### 10.529 Interlock Selection (Pump and Fan Control Application Only)

Location in the menu: **P2.9.23**

This parameter is used to activate the interlock inputs. The interlocking signals come from the motor switches. The signals (functions) are connected to digital inputs which are programmed as interlock inputs using the corresponding parameters. The pump and fan control automatics only control the motors with active interlock data.

- The interlock data can be used even when the Autochange function is not activated.
- If the interlock of an auxiliary drive is inactivated and another unused auxiliary drive available, the latter is put to use without stopping the AC drive.
- If the interlock of the controlled drive is inactivated, all motors are stopped and restarted with the new set-up.
- If the interlock is reactivated in Run status, the automatics functions according to parameter *ID 1032, Interlock selection*, see [table \(ID 1032\) Interlock Selection > #X011233 > simpletable\\_es4\\_llw\\_1gb](#).

See [10.530.1 Pump and Fan Automatics with Interlocks and No Autochange](#) and [10.530.2 Pump and Fan Automatics with Interlocks and Autochange](#).

## 10.530 Examples of Autochange and Interlock Selection

### 10.530.1 Pump and Fan Automatics with Interlocks and No Autochange

#### Context:

- One controlled drive and three auxiliary drives.
- Parameter settings: P2.9.1=3, P2.9.25=0
- Interlock feedback signals used, autochange not used.
- Parameter settings: P2.9.23=1, P2.9.24=0
- The interlock feedback signals come from the digital inputs selected with parameters P2.2.6.18 to P2.2.6.21.
- The Auxiliary drive 1 control (P2.3.1.27) is enabled through Interlock 1 (P2.2.6.18), the Auxiliary drive 2 control (P2.3.1.28) through Interlock 2 (P2.2.6.19) and so on.

When the need of power decreases, the auxiliary drives turn off in the opposite order (2-3-1; after the update 3-2-1).

#### Phases

1. The system and the motor controlled by the AC drive are started.
2. The Auxiliary drive 1 starts when the main drive reaches the starting frequency set (P2.9.2).
3. The main drive decreases speed down to Auxiliary drive 1 Stop frequency (P2.9.3) and starts to rise toward the Start frequency of Auxiliary drive 2, when needed.
4. The Auxiliary drive 2 starts when the main drive has reached the starting frequency set (P2.9.4).
5. The Interlock feedback is removed from Aux. drive 2. Because the Aux. drive 3 is unused, it is started to replace the removed Aux. drive 2.
6. The main drive increases speed to maximum because no more auxiliary drives are available.
7. The removed Aux.drive 2 is reconnected and placed last in the auxiliary drive start order which now is 1-3-2. The main drive decreases speed to the set Stop frequency. The auxiliary drive start order will be updated either immediately or in the next Stop (autochange, sleep, stop, and so on) according to P2.9.23.
8. If still more power is needed, the main drive speed rises up to the maximum frequency placing 100% of the output power available for the system.

### 10.530.2 Pump and Fan Automatics with Interlocks and Autochange

The phases explained in [10.530.1 Pump and Fan Automatics with Interlocks and No Autochange](#) are also applicable when the autochange function is used. In addition to the changed and updated start order, also the change order of main drives depends on parameter P2.9.23.

e30bh022.10

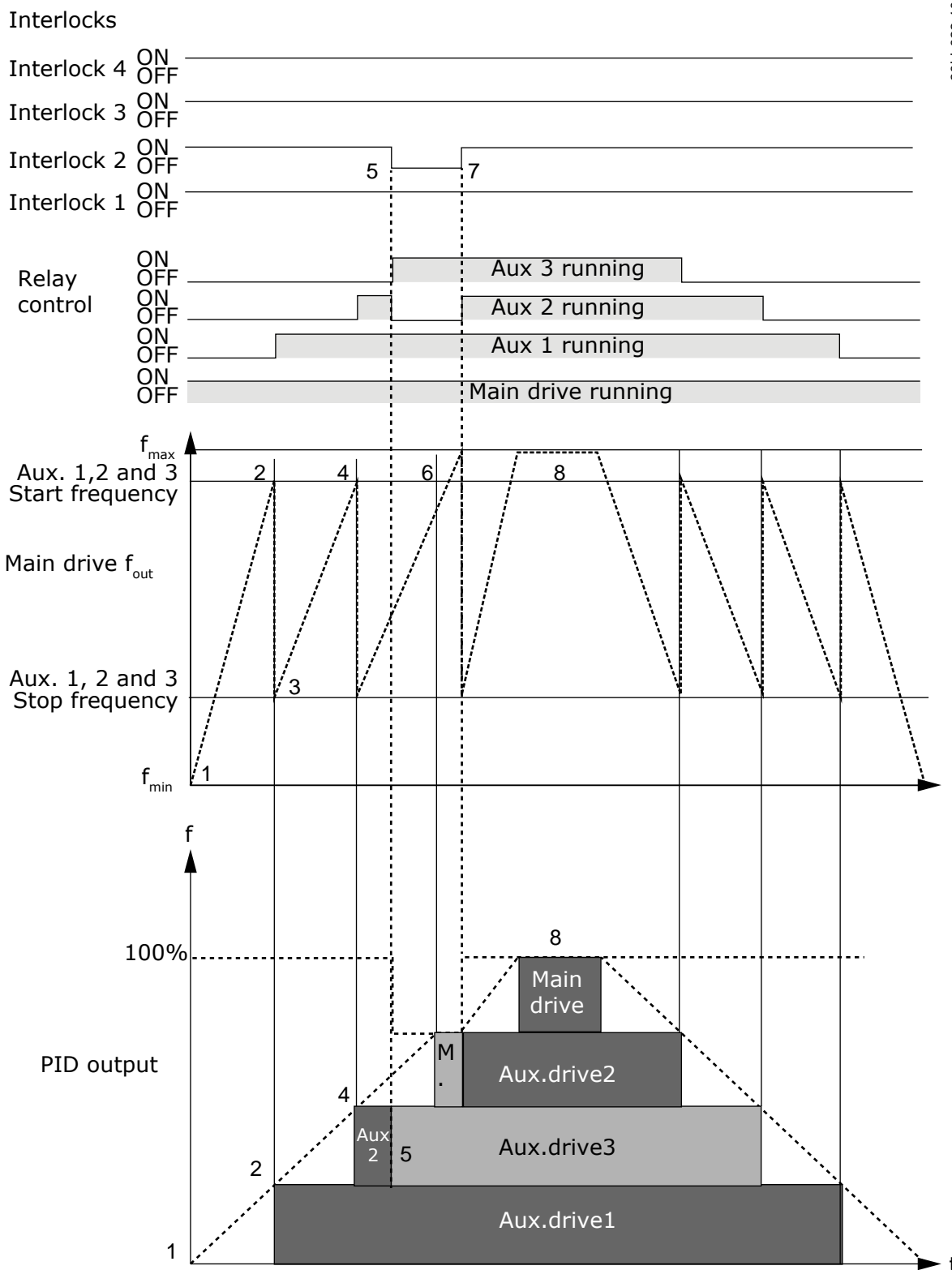
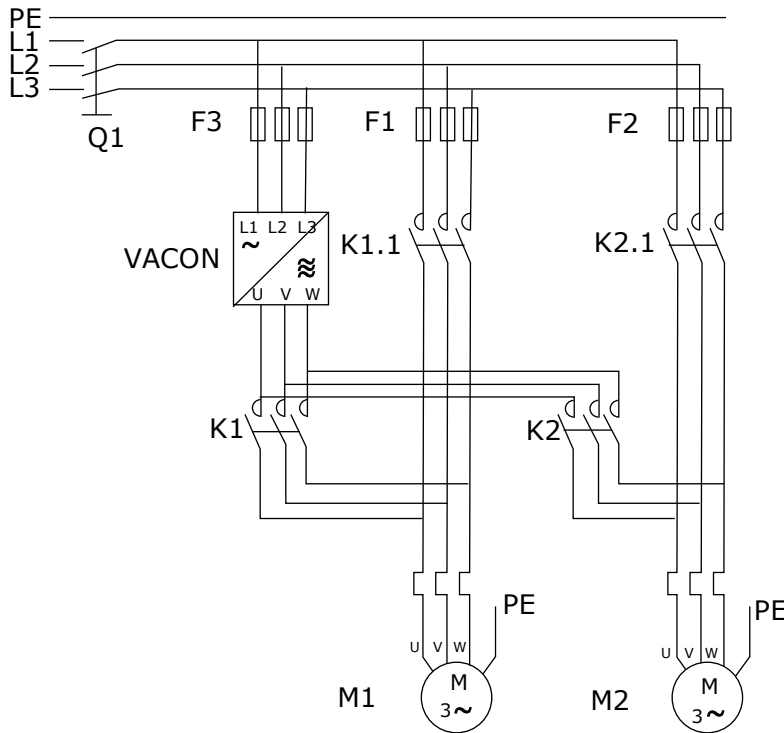
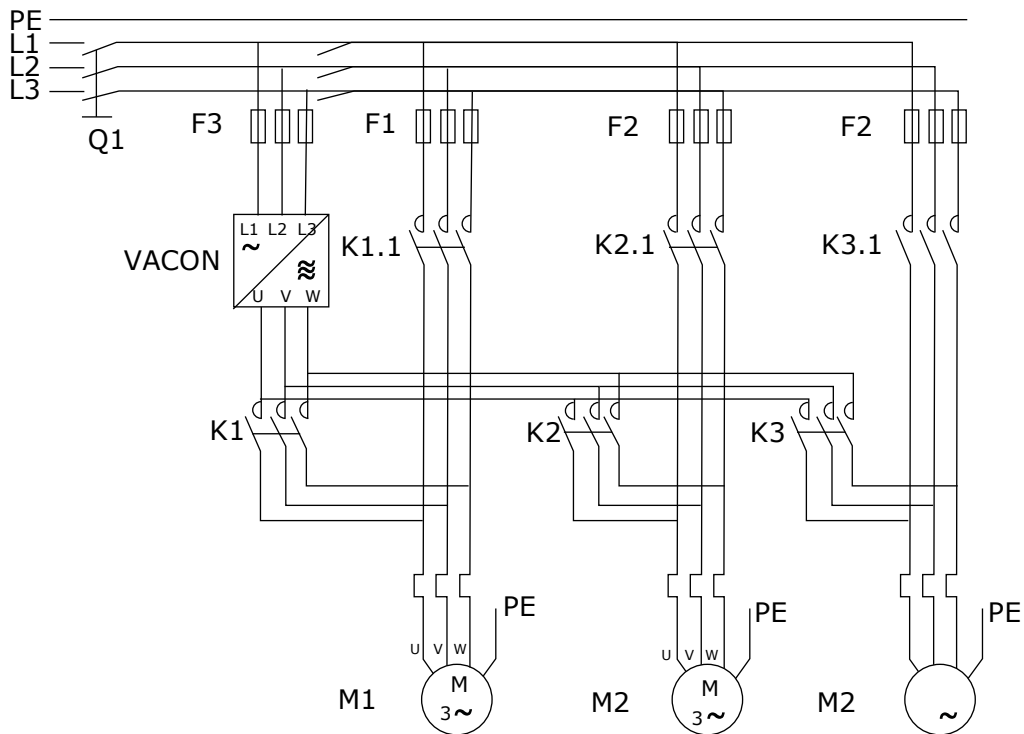


Illustration 109: Example of the Function of the PFC application with Three Aux. Drives



e30bh023.10

Illustration 110: Example of 2-Pump Autochange, Main Diagram



e30bh024.10

Illustration 111: Example of 3-Pump Autochange, Main Diagram

## 10.531 Fieldbus Control in Detail

Combination	P7.x.1.4 Operate Mode (Fieldbus option board)	P2.9.35 Fieldbus State Machine	Note
1	ProfiDrive	Standard	See fieldbus option board manual. Control Word and Status Word are explained there.
2	ByPass	ProfiDrive	See <a href="#">10.531.1 Combination 2: Bypass - ProfiDrive</a> .
3	ByPass	Standard	See <a href="#">10.531.2 Combination 3: Bypass - Standard</a> .
4	ProfiDrive	ProfiDrive	Drive cannot be operated from fieldbus when this combination is activated.

## 10.531.1 Combination 2: Bypass - ProfiDrive

Table 120: Control Word (ProfiDrive)

	Signal	Description
b0	ON	0>1 resets the Switch On Inhibit state and bring the drive to Ready Run. Always reset after fault, Coast Stop (b1), and Quick Stop (b2).
b1	Coast Stop	0=Coast stop Active 1=Coast stop NOT active
b2	Quick Stop	0=Coast stop Active 1=Coast stop NOT active
b3	Start	Normal start command 0=Stop the drive 1=Start the drive
b4	Ramp Output to Zero	0=Force speed ramp output to zero 1=Release speed ramp output
b5	Ramp Hold	0=Hold speed ramp output 1=Release speed ramp
b6	Ramp Input to Zero	0=Force speed ramp input to zero 1=Release speed ramp input
b7	Fault Reset	0=No Action 1=Reset active faults
b8	Inching 1	Run the drive with defined constant speed 0=No Action 1=Run with constant speed



	Signal	Description
b9	Inching 2	Run the drive with defined constant speed 0=No Action 1=Run with constant speed
b10	Fieldbus Control Enable	Activate Fieldbus control when P3.1 =3/Fieldbus 0=Fieldbus Control NOT active 1=Activate Fieldbus Control
b11	FB DIN 1	
b12	FB DIN 2	
b13	FB DIN 3	
b14	FB DIN 4	
b15	Reserved	Reserved for internal use

Table 121: Status Word (ProfiDrive)

	Signal	Description
b0	Ready To Switch On	0=The drive NOT ready to switch ON 1=The drive is ready to switch ON
b1	Ready To Operate	0=The drive is NOT ready to run 1=The drive is ready to run
b2	Operation Enabled	0=The drive is NOT running 1=The drive is running and ready to release the reference
b3	Fault Active	0=No fault active 1=Fault IS active
b4	Coast Stop Not Active	0=Coast stop active 1=Coast stop NOT active
b5	Quick Stop Not Active	0=Emergency stop active 1=Emergency stop NOT active
b6	Switch On Inhibited	0=No Inhibit 1=The drive is out of fault and coast / quick stop state
b7	Warning	0=NO alarm 1=Alarm IS active
b8	Speed At Reference	0=Speed actual is NOT equal to speed reference 1=Speed actual is equal to speed reference

	Signal	Description
b9	Fieldbus Control Active	0=Fieldbus Control NOT active 1=Fieldbus Control active
b10	Speed Reference Reached or Exceeded	Indicate if speed actual is below the limit P2.4.16 0=Speed actual is below the speed limit 1=Speed actual is above the speed limit
b11	Not Used	Reserved
b12	Drive Running	0=Drive is stopped 1=Drive is running
b13	Drive Ready	0=Drive is not ready 1=Drive is ready
b14	Not Used	Reserved
b15	Not Used	Reserved

## 10.531.2 Combination 3: Bypass - Standard

Table 122: Control Word (Standard)

	Signal	Description
b0	Start/Stop	0=Stop the drive 1=Start the drive
b1	Direction	0=Clockwise 1=Counter clockwise
b2	Fault Reset	0=No Action 1=Reset active faults
b3	FB DIN 1	
b4	FB DIN 2	
b5	FB DIN 3	
b6	FB DIN 4	
b7	FB DIN 5	
b8	No action	
b9	No action	
b10	No action	
b11	No action	
b12	No action	

	Signal	Description
b13	No action	
b14	No action	
b15	Reserved	Reserved for internal use

Table 123: Status Word (Standard)

	Signal	Description
b0	Ready To Switch On	0=The drive NOT ready to switch ON 1=The drive is ready to switch ON
b1	Ready To Operate	0=The drive is NOT ready to run 1=The drive is ready to run
b2	Operation Enabled	0=The drive is NOT running 1=The drive is running and ready to release the reference
b3	Fault Active	0=No fault active 1=Fault IS active
b4	Coast Stop Not Active	0=Coast stop active 1=Coast stop NOT active
b5	Quick Stop Not Active	0=Emergency stop active 1=Emergency stop NOT active
b6	Switch On Inhibited	0=No Inhibit 1=The drive is out of fault and coast / quick stop state
b7	Warning	0=NO alarm 1=Alarm IS active
b8	Speed At Reference	0=Speed actual is NOT equal to speed reference 1=Speed actual is equal to speed reference
b9	Fieldbus Control Active	0=Fieldbus Control NOT active 1=Fieldbus Control active
b10	Speed Reference Reached or Exceeded	Indicate if speed actual is below the limit P2.4.16 0=Speed actual is below the speed limit 1=Speed actual is above the speed limit
b11	Not Used	Reserved
b12	Drive Running	0=Drive is stopped 1=Drive is running

	Signal	Description
b13	Drive Ready	0=Drive is not ready 1=Drive is ready
b14	Not Used	Reserved
b15	Not Used	Reserved

## 11 Fault Tracing

### 11.1 Faults and Alarms

#### 11.1.1 Fault 1 - Overcurrent, S1- Hardware trip

##### Cause

There is too high a current ( $>4 \cdot I_H$ ) in the motor cable. Its cause can be 1 of the following:

- a sudden heavy load increase
- a short circuit in the motor cables
- the motor is not the correct type

##### Troubleshooting

- Do a check of the loading.
- Do a check of the motor.
- Do a check of the cables and connections.
- Make an identification run.

#### 11.1.2 Fault 1 - Overcurrent, S2 - Current cutter supervision (VACON® NXS)

##### Cause

There is too high a current ( $>4 \cdot I_H$ ) in the motor cable. Its cause can be 1 of the following:

- a sudden heavy load increase
- a short circuit in the motor cables
- the motor is not the correct type

##### Troubleshooting

- Do a check of the loading.
- Do a check of the motor.
- Do a check of the cables and connections.
- Make an identification run.

#### 11.1.3 Fault 1 - Overcurrent, S3 - Current limit controller supervision

##### Cause

There is too high a current ( $>4 \cdot I_H$ ) in the motor cable. Its cause can be 1 of the following:

- a sudden heavy load increase
- a short circuit in the motor cables
- the motor is not the correct type

**Troubleshooting**

- Do a check of the loading.
- Do a check of the motor.
- Do a check of the cables and connections.
- Make an identification run.

**11.1.4 Fault 1 - Overcurrent, S4 - Software-based overcurrent fault****Cause**

There is too high a current in the motor cable. Its cause can be 1 of the following:

- a sudden heavy load increase
- a short circuit in the motor cables
- the motor is not the correct type

**Troubleshooting**

- Do a check of the loading.
- Do a check of the motor.
- Do a check of the cables and connections.
- Make an identification run.

**11.1.5 Fault 2 - Overvoltage, S1 - Hardware trip****Cause**

The DC-link voltage is higher than the limits.

- Too short a deceleration time
- High overvoltage spikes in the supply
- Start/Stop sequence too fast

**Troubleshooting**

- Set the deceleration time longer.
- Use the brake chopper or the brake resistor. They are available as options.
- Activate the overvoltage controller.
- Do a check of the input voltage.

**11.1.6 Fault 2 - Overvoltage, S2 - Overvoltage control supervision****Cause**

The DC-link voltage is higher than the limits.

- Too short a deceleration time
- High overvoltage spikes in the supply
- Motor load is generative
- Start/Stop sequence too fast

#### Troubleshooting

- Set the deceleration time longer.
- Use the brake chopper or the brake resistor. They are available as options.
- Activate the overvoltage controller.
- Do a check of the input voltage.

### 11.1.7 Fault 2 - Overvoltage, S3 - LCL capacitor overvoltage ripple

#### Cause

AFE LCL filter capacitor ripple voltage is too high

#### Troubleshooting

Check the capacitance rating and measure the capacitance value of the LCL filter capacitors and make sure that the value and rating is according to specifications.

### 11.1.8 Fault 3 - Earth fault

#### Cause

The measurement of current tells that the sum of the motor phase current is not zero.

- Insulation malfunction in the cables or in the motor.

It is possible to set different responses in the application for this fault. See parameter group Protections.

#### Troubleshooting

Do a check of the motor cables and the motor.

### 11.1.9 Fault 5 - Charging switch

#### Cause

The charging switch is open, when the START command is given.

- Operation malfunction
- Defective component

#### Troubleshooting

- Reset the fault and start the drive again.
- If the fault shows again, ask instructions from the local distributor.

### 11.1.10 Fault 6 - Emergency stop

#### Cause

Stop signal has been given from the option board.

#### Troubleshooting

Do a check of the emergency stop circuit.

### 11.1.11 Fault 7 - Saturation trip

#### Cause

- defective component
- brake resistor short circuit or overload

#### Troubleshooting

This fault cannot be reset from the control panel.

- Switch off the power.
- DO NOT RESTART THE DRIVE or CONNECT THE POWER!
- Ask instructions from the factory. If this fault shows at the same time with Fault 1, do a check of the motor cable and the motor.

### 11.1.12 Fault 8 - System fault, S1 - ASIC phase feedback

#### Cause

- operation malfunction
- defective component

#### Troubleshooting

- Reset the fault and start the drive again.
- If the fault shows again, ask instructions from the local distributor.

### 11.1.13 Fault 8 - System fault, S4 - ASIC trip

#### Cause

- operation malfunction
- defective component

#### Troubleshooting

- Reset the fault and start the drive again.
- If the fault shows again, ask instructions from the local distributor.



### 11.1.14 Fault 8 - System fault, S5 - Disturbance in VaconBus

#### Cause

- operation malfunction
- defective component

#### Troubleshooting

- Reset the fault and start the drive again.
- If the fault shows again, ask instructions from the local distributor.

### 11.1.15 Fault 8 - System fault, S6 - Feedback of charging switch

#### Cause

- operation malfunction
- defective component

#### Troubleshooting

- Reset the fault and start the drive again.
- If the fault shows again, ask instructions from the local distributor.

### 11.1.16 Fault 8 - System fault, S7 - Charging switch

#### Cause

- operation malfunction
- defective component

#### Troubleshooting

- Reset the fault and start the drive again.
- If the fault shows again, ask instructions from the local distributor.

### 11.1.17 Fault 8 - System fault, S8 - No power to driver card

#### Cause

- operation malfunction
- defective component

#### Troubleshooting

- Reset the fault and start the drive again.
- If the fault shows again, ask instructions from the local distributor.

### 11.1.18 Fault 8 - System fault, S9 - Power unit communication (TX)

#### Cause

- operation malfunction
- defective component

**Troubleshooting**

- Reset the fault and start the drive again.
- If the fault shows again, ask instructions from the local distributor.

**11.1.19 Fault 8 - System fault, S10 - Power unit communication (Trip)****Cause**

- operation malfunction
- defective component

**Troubleshooting**

- Reset the fault and start the drive again.
- If the fault shows again, ask instructions from the local distributor.

**11.1.20 Fault 8 - System fault, S11 - Power unit comm. (Measurement)****Cause**

- operation malfunction
- defective component

**Troubleshooting**

- Reset the fault and start the drive again.
- If the fault shows again, ask instructions from the local distributor.

**11.1.21 Fault 8 - System fault, S12 - System bus fault (slot D or E)****Cause**

Error in system bus option board (OPTD1 or OPTD2) in slot D or E.

- operation malfunction
- defective component

**Troubleshooting**

- Reset the fault and start the drive again.
- If the fault shows again, ask instructions from the local distributor.
- Check the cables and connections.

**11.1.22 Fault 8 - System fault, S30 - OPTAF: STO channels are different from each other****Cause**

The Safe Disable inputs are in different states. It is not allowed according to EN954-1, category 3. This fault occurs when the Safe Disable inputs are in different states for more than 5 s.

**Troubleshooting**

- Check the S1 switch.
- Check the cabling to the OPTAF board.
- If the fault shows again, ask instructions from the local distributor.

**11.1.23 Fault 8 - System fault, S31 - OPTAF: Thermistor short circuit detected****Cause**

Thermistor short circuit detected.

**Troubleshooting**

- Correct the cable connections.
- Check the jumper for the thermistor short circuit supervision, if the thermistor function is not used and the thermistor input is short-circuited.

**11.1.24 Fault 8 - System fault, S32 - OPTAF board has been removed****Cause**

OPTAF board has been removed. It is not allowed to remove the OPTAF board once the software has recognized it.

**Troubleshooting**

The system requires a manual acknowledgement using *System* menu parameter 6.5.5 OPTAF Remove. Ask help from the local distributor.

**11.1.25 Fault 8 - System fault, S33 - OPTAF: EEPROM error****Cause**

OPTAF board EEPROM error (checksum, not answering and so on).

**Troubleshooting**

Change the OPTAF board.

**11.1.26 Fault 8 - System fault, S34 - OPTAF: Voltage problem****Cause**

OPTAF supply voltage hardware problem detected.

**Troubleshooting**

Change the OPTAF board.

### 11.1.27 Fault 8 - System fault, S35 - Overvoltage

#### Cause

OPTAF supply voltage hardware problem detected.

#### Troubleshooting

Change the OPTAF board.

### 11.1.28 Fault 8 - System fault, S36 - OPTAF: Undervoltage

#### Cause

OPTAF supply voltage hardware problem detected.

#### Troubleshooting

Change the OPTAF board.

### 11.1.29 Fault 8 - System fault, S37 - OPTAF: Test pulse is not detected in both STO channels

#### Cause

Single hardware problem detected in Safe Disable inputs.

#### Troubleshooting

- Change the OPTAF board.
- Change the control board.

### 11.1.30 Fault 8 - System fault, S38 - OPTAF: Test pulse is not detected in STO channel 1

#### Cause

Single hardware problem detected in Safe Disable inputs.

#### Troubleshooting

- Change the OPTAF board.
- Change the control board.

### 11.1.31 Fault 8 - System fault, S39 - OPTAF: Test pulse is not detected in STO channel 2

#### Cause

Single hardware problem detected in Safe Disable inputs.

#### Troubleshooting

- Change the OPTAF board.
- Change the control board.

### 11.1.32 Fault 8 - System fault, S40 - OPTAF: ASIC trip ETR is not set, even if STO channel 1 is active

#### Cause

Single hardware problem detected in Safe Disable inputs.

#### Troubleshooting

- Change the OPTAF board.
- Change the control board.

### 11.1.33 Fault 8 - System fault, S41 - OPTAF: STO channels are not active when the thermistor trip is active

#### Cause

Single hardware problem detected in the thermistor input.

#### Troubleshooting

Change the OPTAF board.

### 11.1.34 Fault 8 - System fault, S42 - OPTAF: Test pulse low is not detected on thermistor

#### Cause

Single hardware problem detected in the thermistor input.

#### Troubleshooting

Change the OPTAF board.

### 11.1.35 Fault 8 - System fault, S43 - OPTAF: Test pulse high is not detected on thermistor

#### Cause

Single hardware problem detected in the thermistor input.

#### Troubleshooting

Change the OPTAF board.

### 11.1.36 Fault 8 - System fault, S44 - OPTAF: STO channel 1 is not active, even if the analog input supervision indicates it

#### Cause

Single hardware problem detected in Safe Disable inputs or in the thermistor input.

**Troubleshooting**

- Change the OPTAF board.
- Change the control board.

**11.1.37 Fault 8 - System fault, S45 - OPTAF: STO channel 2 is not active, even if the analog input supervision indicates it****Cause**

Single hardware problem detected in Safe Disable inputs or in the thermistor input.

**Troubleshooting**

- Change the OPTAF board.
- Change the control board.

**11.1.38 Fault 8 - System fault, S46 - OPTAF: Thermistor or analog input is not set, even if STO is active****Cause**

Single hardware problem detected in Safe Disable inputs or in the thermistor input.

**Troubleshooting**

- Change the OPTAF board.
- Change the control board.

**11.1.39 Fault 8 - System fault, S47 - OPTAF: Board mounted in old NXP control board with no safety hardware****Cause**

OPTAF board mounted in old VACON® NXP control board, which is not equipped with the Safe Disable function.

**Troubleshooting**

Change the control board to VB00561 revision H or newer.

**11.1.40 Fault 8 - System fault, S48 - OPTAF: Mismatch between Therm Trip (HW) parameter and jumper setting****Cause**

The parameter Expander boards/ SlotB/ Therm Trip(HW) is set to OFF even though the jumper X12 is not cut.

**Troubleshooting**

Correct the parameter 7.2.1.1 Therm Trip (HW) to match the X12 jumper setting.

#### 11.1.41 Fault 8 - System fault, S49 - OPTAF: Board mounted in VACON NXS control board

##### Cause

OPTAF is only compatible with VACON® NXP.

##### Troubleshooting

Remove the OPTAF board.

#### 11.1.42 Fault 8 - System fault, S50 - OPTAF: Filter discharge resistor fault

##### Cause

Problem with the control board.

##### Troubleshooting

Ask instructions from the local distributor.

#### 11.1.43 Fault 8 - System fault, S70 - False fault activated

##### Cause

Fault in application.

##### Troubleshooting

Ask instructions from the local distributor.

#### 11.1.44 Fault 9 - Undervoltage, S1 - DC-link too low during run

##### Cause

The DC-link voltage is lower than the limits.

- Too low a supply voltage
- AC drive internal fault
- A defective input fuse
- The external charge switch is not closed.

It is possible to set different responses in the application for this fault. See parameter group Protections.

##### Troubleshooting

- If there is a temporary supply voltage break, reset the fault and start the drive again.
- Do a check of the supply voltage. If the supply voltage is sufficient, there is an internal fault.
- Ask instructions from the local distributor.

### 11.1.45 Fault 9 - Undervoltage, S2 - No data from power unit

#### Cause

The DC-link voltage is lower than the limits.

- Too low a supply voltage
- AC drive internal fault
- a defective input fuse
- the external charge switch is not closed.

It is possible to set different responses in the application for this fault. See parameter group Protections.

#### Troubleshooting

- If there is a temporary supply voltage break, reset the fault and start the drive again.
- Do a check of the supply voltage. If the supply voltage is sufficient, there is an internal fault.
- Ask instructions from the local distributor.

### 11.1.46 Fault 9 - Undervoltage, S3 - Undervoltage control supervision

#### Cause

The DC-link voltage is lower than the limits.

- Too low a supply voltage
- AC drive internal fault
- A defective input fuse
- The external charge switch is not closed.

It is possible to set different responses in the application for this fault. See parameter group Protections.

#### Troubleshooting

- If there is a temporary supply voltage break, reset the fault and start the drive again.
- Do a check of the supply voltage. If the supply voltage is sufficient, there is an internal fault.
- Ask instructions from the local distributor.

### 11.1.47 Fault 10 - Input line supervision, S1 - Phase supervision diode supply

#### Cause

The input line phase is missing.

It is possible to set different responses in the application for this fault. See parameter group Protections.

#### Troubleshooting

Do a check of the supply voltage, the fuses, and supply cable.



### 11.1.48 Fault 10 - Input line supervision, S2 - Phase supervision active front-end

#### Cause

Line sync fault. AFE is not able to synchronize to line after five trials.

It is possible to set different responses in the application for this fault. See parameter group Protections.

#### Troubleshooting

- Check that input contactor closes.
- Check all fuses.
- Check that LCL filter is not broken.
- Try to activate a longer sync pulse with AFEOptions1.B8.

### 11.1.49 Fault 10 - Input line supervision, S3 - Phase supervision active front end, Microgrid

#### Cause

Frequency exceeds the line frequency min/max limits. It is possible that the frequency limits are too tight compared to other generators.

Underfrequency appears if:

- DC-link voltage is too low to produce defined output voltage, which activates undervoltage controller.
- There is not enough power in the grid compared to power consumed by loads.

Overfrequency appears if:

- Overvoltage control activates due to too high DC-link voltage.
- There is too much power generation compared to consumers.

#### Troubleshooting

- Check that DC-link voltage is in proper range.
- Check that limiters, for example, Power and Current limits, are not activated.

### 11.1.50 Fault 11 - Output phase supervision, S1 - Common output phase supervision

#### Cause

The measurement of current tells that there is no current in 1 motor phase.

It is possible to set different responses in the application for this fault. See parameter group Protections.

#### Troubleshooting

Do a check of the motor cable and the motor.

### 11.1.51 Fault 11 - Output phase supervision, S2 - Additional closed loop control output phase fault

#### Cause

The measurement of current tells that there is no current in 1 motor phase.

It is possible to set different responses in the application for this fault. See parameter group Protections.

#### Troubleshooting

Do a check of the motor cable and the motor.

### 11.1.52 Fault 11 - Output phase supervision, S3 - Additional open loop control output phase fault during start DC brake

#### Cause

The measurement of current tells that there is no current in 1 motor phase.

It is possible to set different responses in the application for this fault. See parameter group Protections.

#### Troubleshooting

Do a check of the motor cable and the motor.

### 11.1.53 Fault 11 - Output phase supervision, S4 - Additional closed loop output phase fault during PM StartAngleID run

#### Cause

The measurement of current tells that there is no current in 1 motor phase.

It is possible to set different responses in the application for this fault. See parameter group Protections.

#### Troubleshooting

Do a check of the motor cable and the motor.

### 11.1.54 Fault 12 - Brake chopper supervision

#### Cause

- There is no brake resistor.
- The brake resistor is broken.
- A defective brake chopper.

#### Troubleshooting

- Do a check of the brake resistor and the cabling.
- If they are in good condition, there is a fault in the resistor or the brake chopper. Ask instructions from the local distributor.

### 11.1.55 Fault 13 - AC drive undertemperature

#### Cause

Too low a temperature in the heat sink of the power unit or in the power board. The heat sink temperature is below -10 °C (14 °F).

#### Troubleshooting

Add an external heater near the AC drive.

### 11.1.56 Fault 14 - AC drive overtemperature, S1 - Overtemperature warning in unit, board, or phases

#### Cause

Overheating detected in AC drive.

Heat sink temperature is over 90 °C (194 °F). Overtemperature alarm is issued when the heat sink temperature goes over 85 °C (185 °F).

In 525–690 V, FR6: Heat sink temperature is over 77 °C (170.6 °F). Overtemperature alarm is issued when the heat sink temperature goes over 72 °C (161.6 °F).

#### Troubleshooting

- Do a check of the actual amount and flow of cooling air.
- Examine the heat sink for dust.
- Do a check of the ambient temperature.
- Make sure that the switching frequency is not too high in relation to the ambient temperature and the motor load.

### 11.1.57 Fault 14 - AC drive overtemperature, S2 - Overtemperature in power board

#### Cause

Overheating detected in AC drive.

Heat sink temperature is over 90 °C (194 °F). Overtemperature alarm is issued when the heat sink temperature goes over 85 °C (185 °F).

In 525–690 V, FR6: Heat sink temperature is over 77 °C (170.6 °F). Overtemperature alarm is issued when the heat sink temperature goes over 72 °C (161.6 °F).

#### Troubleshooting

- Do a check of the actual amount and flow of cooling air.
- Examine the heat sink for dust.
- Do a check of the ambient temperature.
- Make sure that the switching frequency is not too high in relation to the ambient temperature and the motor load.

### 11.1.58 Fault 14 - AC drive overtemperature, S3 - Liquid flow

#### Cause

Appears when the liquid flow supervision is activated, and problems in cooling liquid flow are detected.

**Troubleshooting**

- Check the correct cooling liquid flow and temperature.
- Check the circulation for possible leaks.
- Do a check of the ambient temperature.
- Make sure that the switching frequency is not too high in relation to the ambient temperature and the motor load.

**11.1.59 Fault 14 - AC drive overtemperature, S4 - Overtemperature on ASIC board or driver boards****Cause**

Overheating detected in AC drive.

Heat sink temperature is over 90 °C (194 °F). Overtemperature alarm is issued when the heat sink temperature goes over 85 °C (185 °F).

In 525–690 V, FR6: Heat sink temperature is over 77 °C (170.6 °F). Overtemperature alarm is issued when the heat sink temperature goes over 72 °C (161.6 °F).

**Troubleshooting**

- Do a check of the actual amount and flow of cooling air.
- Examine the heat sink for dust.
- Do a check of the ambient temperature.
- Make sure that the switching frequency is not too high in relation to the ambient temperature and the motor load.

**11.1.60 Fault 15 - Motor stalled****Cause**

The motor stalled.

It is possible to set different responses in the application for this fault. See parameter group Protections.

**Troubleshooting**

Do a check of the motor and the load.

**11.1.61 Fault 16 - Motor overtemperature****Cause**

There is too heavy a load on the motor.

It is possible to set different responses in the application for this fault. See parameter group Protections.

**Troubleshooting**

- Decrease the motor load.
- If there is no motor overload, do a check of the temperature model parameters.

### 11.1.62 Fault 17 - Motor underload

#### Cause

Motor underload protection has tripped.

It is possible to set different responses in the application for this fault. See parameter group Protections.

#### Troubleshooting

Do a check of the load.

### 11.1.63 Fault 18 - Unbalance, S1 - Current unbalance

#### Cause

Unbalance between power modules in paralleled power units.

This fault is type A fault (Alarm).

#### Troubleshooting

If the fault occurs again, ask instructions from the local distributor.

### 11.1.64 Fault 18 - Unbalance, S2 - DC voltage unbalance

#### Cause

Unbalance between power modules in paralleled power units.

This fault is type A fault (Alarm).

#### Troubleshooting

If the fault occurs again, ask instructions from the local distributor.

### 11.1.65 Fault 19 - Current overload

#### Cause

Motor current overload warning.

#### Troubleshooting

Ask instructions from the local distributor.

### 11.1.66 Fault 22 - Parameter fault, S1 - Firmware interface power down variable checksum error

#### Cause

Parameter save fault.

- Operation malfunction
- defective component

#### Troubleshooting

If the fault occurs again, ask instructions from the local distributor.

### 11.1.67 Fault 22 - Parameter fault, S2 Firmware interface variable check sum error

#### Cause

Parameter save fault.

- Operation malfunction
- defective component

#### Troubleshooting

If the fault occurs again, ask instructions from the local distributor.

### 11.1.68 Fault 22 - Parameter fault, S3 - System power down variable check sum error

#### Cause

Parameter save fault.

- Operation malfunction
- defective component

#### Troubleshooting

If the fault occurs again, ask instructions from the local distributor.

### 11.1.69 Fault 22 - Parameter fault, S4 - System parameter checksum error

#### Cause

Parameter save fault.

- Operation malfunction
- defective component

#### Troubleshooting

If the fault occurs again, ask instructions from the local distributor.

### 11.1.70 Fault 22 - Parameter fault, S5 - Application-defined power-down, variable checksum error

#### Cause

Parameter save fault.

- Operation malfunction
- defective component

#### Troubleshooting

If the fault occurs again, ask instructions from the local distributor.

### 11.1.71 Fault 22 - Parameter fault, S6 - Application-defined power-down, variable checksum

#### Cause

Parameter save fault.

- Operation malfunction
- defective component

#### Troubleshooting

If the fault occurs again, ask instructions from the local distributor.

### 11.1.72 Fault 22 - Parameter fault, S10 - System parameter checksum error

#### Cause

Parameter save fault.

- Operation malfunction
- defective component

#### Troubleshooting

If the fault occurs again, ask instructions from the local distributor.

### 11.1.73 Fault 22 - Parameter fault, S13 - Checksum error in application-specific parameter set

#### Cause

Parameter save fault.

#### Troubleshooting

- Recommission the application.
- Check parameters.

### 11.1.74 Fault 24 - Counter fault

#### Cause

Values that showed on the counters are incorrect.

#### Troubleshooting

Have a critical attitude towards values shown on counters.

### 11.1.75 Fault 25 - Microprocessor watchdog fault, S1 - CPU watchdog timer

#### Cause

- operation malfunction
- defective component

#### Troubleshooting

- Reset the fault and start the drive again.
- If the fault shows again, ask instructions from the local distributor.

### 11.1.76 Fault 25 - Microprocessor watchdog fault, S2 - ASIC reset

#### Cause

- operation malfunction
- defective component

#### Troubleshooting

- Reset the fault and start the drive again.
- If the fault shows again, ask instructions from the local distributor.

### 11.1.77 Fault 26 - Start-up prevented, S1 - Prevention of accidental start-up

#### Cause

Start-up of the drive has been prevented. Run request is ON when new application is downloaded to the drive.

#### Troubleshooting

- Cancel prevention of start-up if it can be done safely.
- Remove Run request.

### 11.1.78 Fault 26 - Start-up prevented, S2 - RUN request is kept active after drive returns to READY state from safe state

#### Cause

Start-up of the drive has been prevented. START command is ON when returning to READY state after Safe Disable has been active.



**Troubleshooting**

- Cancel prevention of start-up if it can be done safely.
- Remove Run request.

**11.1.79 Fault 26 - Start-up prevented, S30 - RUN request given too quickly****Cause**

Start-up of the drive has been prevented. START command is ON after system software or application was downloaded, or after application was changed.

**Troubleshooting**

- Cancel prevention of start-up if it can be done safely.
- Remove Run request.

**11.1.80 Fault 29 - Thermistor fault, S1 Thermistor input activated on OPTAF board****Cause**

The thermistor input of option board has detected increase of the motor temperature.

It is possible to set different responses in the application for this fault. See parameter group Protections.

**Troubleshooting**

- Do a check of the motor cooling and loading.
- Do a check of the thermistor connection.
- (If thermistor input of the option board is not in use it has to be short-circuited).

**11.1.81 Fault 29 - Thermistor fault, S2 - Special application****Cause**

The thermistor input of option board has detected increase of the motor temperature.

It is possible to set different responses in the application for this fault. See parameter group Protections.

**Troubleshooting**

- Do a check of the motor cooling and loading.
- Do a check of the thermistor connection.
- (If thermistor input of the option board is not in use it has to be short-circuited).

**11.1.82 Fault 30 - Safe disable****Cause**

The input on OPTAF board has opened.

STO inputs SD1 and SD2 are activated through the OPTAF option board.

### Troubleshooting

Cancel Safe Disable if it can be done safely.

## 11.1.83 Fault 31 - IGBT temperature (hardware)

### Cause

IGBT Inverter Bridge overtemperature protection has detected too high a short-term overload current.

### Troubleshooting

- Do a check of the loading.
- Do a check of the motor frame size.
- Make an identification run.

## 11.1.84 Fault 32 - Fan cooling

### Cause

Cooling fan of the AC drive does not start, when ON command is given.

### Troubleshooting

Ask instructions from the local distributor.

## 11.1.85 Fault 34 - CAN bus communication

### Cause

Sent message not acknowledged.

### Troubleshooting

Make sure that there is another device on the bus with the same configuration.

## 11.1.86 Fault 35 - Application

### Cause

Problem in application software.

### Troubleshooting

- Ask instructions from the local distributor.
- For an application programmer: do a check of the application program.

### 11.1.87 Fault 36 - Control unit

#### Cause

- The software needs newer version of the control unit.

#### Troubleshooting

- Change the control unit.

### 11.1.88 Fault 37 - Device changed (same type), S1 - Control board

#### Cause

A new option board has replaced the old one in the same slot. The parameters are available in the drive.

#### Troubleshooting

Reset the fault. The device is ready for use. The drive starts to use the old parameter settings.

### 11.1.89 Fault 38 - Device added (same type), S1 - Control board

#### Cause

The option board was added. The same option board has been used in the same slot before. The parameters are available in the drive.

#### Troubleshooting

Reset the fault. The device is ready for use. The drive starts to use the old parameter settings.

### 11.1.90 Fault 39 - Device removed

#### Cause

An option board was removed from the slot.

#### Troubleshooting

The device is not available. Reset the fault.

### 11.1.91 Fault 40 - Device unknown, S1 - Unknown device

#### Cause

An unknown or mismatching device was connected (the power unit or option board).

#### Troubleshooting

Ask instructions from the local distributor.

### 11.1.92 Fault 40 - Device unknown, S2 - StarCoupler: power sub units are not identical

#### Cause

An unknown or mismatching device was connected (the power unit or option board).

#### Troubleshooting

Ask instructions from the local distributor.

### 11.1.93 Fault 40 - Device unknown, S3 - StarCoupler is not compatible with the control board

#### Cause

An unknown or mismatching device was connected (the power unit or option board).

#### Troubleshooting

Ask instructions from the local distributor.

### 11.1.94 Fault 40 - Device unknown, S4 - Wrong PropertiesType in control board EEPROM

#### Cause

An unknown or mismatching device was connected (the power unit or option board).

#### Troubleshooting

Ask instructions from the local distributor.

### 11.1.95 Fault 40 - Device unknown, S5 - Wrong VACON® NXP control board EEPROM size detected

#### Cause

An unknown or mismatching device was connected (the power unit or option board).

#### Troubleshooting

Ask instructions from the local distributor.

### 11.1.96 Fault 40 - Device unknown, S6 - Old power unit (Asic) and new software mismatch

#### Cause

An unknown or mismatching device was connected (the power unit or option board).

#### Troubleshooting

Ask instructions from the local distributor.

### 11.1.97 Fault 40 - Device unknown, S7 - Old ASIC detected

#### Cause

An unknown or mismatching device was connected (the power unit or option board).

#### Troubleshooting

Ask instructions from the local distributor.

### 11.1.98 Fault 41 - IGBT temperature, S1 - Calculated IGBT temperature too high

#### Cause

IGBT Inverter Bridge overtemperature protection has detected too high a short-term overload current.

#### Troubleshooting

- Do a check of the loading.
- Do a check of the motor frame size.
- Make an identification run.

### 11.1.99 Fault 41 - IGBT temperature, S2 - AFE current is higher than defined EON current limit during the grid fault

#### Cause

AFE EON-function current limiter (cutter) has been active longer than 50 ms during the grid fault.

#### Troubleshooting

Ask instructions from the factory to check the settings.

### 11.1.100 Fault 41 - IGBT temperature, S3 - Calculated IGBT temperature too high (long-term protection)

#### Cause

IGBT Inverter Bridge overtemperature protection has detected too high a short-term overload current.

#### Troubleshooting

- Do a check of the loading.
- Do a check of the motor frame size.
- Make an identification run.

### 11.1.101 Fault 41 - IGBT temperature, S4 - Peak current too high

#### Cause

IGBT Inverter Bridge overtemperature protection has detected too high a short-term overload current.

**Troubleshooting**

- Do a check of the loading.
- Do a check of the motor frame size.
- Make an identification run.

**11.1.102 Fault 41 - IGBT temperature, S5 - BCU: Filtered current too high for some time****Cause**

IGBT Inverter Bridge overtemperature protection has detected too high a short-term overload current.

**Troubleshooting**

- Do a check of the loading.
- Do a check of the motor frame size.
- Make an identification run.

**11.1.103 Fault 41 - IGBT temperature, S6 - BCU: Current momentarily too high****Cause**

IGBT Inverter Bridge overtemperature protection has detected too high a short-term overload current.

**Troubleshooting**

- Do a check of the loading.
- Do a check of the motor frame size.
- Make an identification run.
- Do a check brake resistor resistance.

**11.1.104 Fault 42 - Brake resistor overtemperature, S1 - Internal brake chopper overtemperature****Cause**

Brake resistor overtemperature protection has detected too heavy braking.

**Troubleshooting**

- Reset unit.
- Set the deceleration time longer.
- Dimensioning of the brake chopper is not correct.
- Use external brake resistor.

**11.1.105 Fault 42 - Brake resistor overtemperature, S2 - Brake resistance too high (BCU)****Cause**

Brake resistor overtemperature protection has detected too heavy braking.

**Troubleshooting**

- Reset unit.
- Set the deceleration time longer.
- Dimensioning of the brake chopper is not correct.
- Use external brake resistor.

**11.1.106 Fault 42 - Brake resistor overtemperature, S3 - Brake resistance too low (BCU)****Cause**

Brake resistor overtemperature protection has detected too heavy braking.

**Troubleshooting**

- Reset unit.
- Set the deceleration time longer.
- Dimensioning of the brake chopper is not correct.
- Use external brake resistor.

**11.1.107 Fault 42 - Brake resistor overtemperature, S4 - Brake resistance not detected (BCU)****Cause**

Brake resistor overtemperature protection has detected too heavy braking.

**Troubleshooting**

- Reset unit.
- Set the deceleration time longer.
- Dimensioning of the brake chopper is not correct.
- Use external brake resistor.

**11.1.108 Fault 42 - Brake resistor overtemperature, S5 - Brake resistance leakage (earth fault) (BCU)****Cause**

Brake resistor overtemperature protection has detected too heavy braking.

**Troubleshooting**

- Reset unit.
- Set the deceleration time longer.
- Dimensioning of the brake chopper is not correct.
- Use external brake resistor.

### 11.1.109 Fault 43 - Encoder fault, S1 - Encoder 1 channel A is missing

#### Cause

Problem detected in encoder signals.

Encoder channel A is missing.

#### Troubleshooting

- Do a check of the encoder connections.
- Do a check of the option board.
- Measure the encoder pulses.
  - If the pulses are correct, the option board is faulty.
  - If the pulses are not correct, the encoder/cabling is faulty.

### 11.1.110 Fault 43 - Encoder fault, S2 - Encoder 1 channel B is missing

#### Cause

Problem detected in encoder signals.

Encoder channel B is missing.

#### Troubleshooting

- Do a check of the encoder connections.
- Do a check of the option board.
- Measure the encoder pulses.
  - If the pulses are correct, the option board is faulty.
  - If the pulses are not correct, the encoder/cabling is faulty.

### 11.1.111 Fault 43 - Encoder fault, S3 - Both encoder 1 channels are missing

#### Cause

Problem detected in encoder signals.

Encoder channels A and B are missing.

#### Troubleshooting

- Do a check of the encoder connections.
- Do a check of the option board.
- Measure the encoder pulses.
  - If the pulses are correct, the option board is faulty.
  - If the pulses are not correct, the encoder/cabling is faulty.



### 11.1.112 Fault 43 - Encoder fault, S4 - Encoder reversed

#### Cause

Problem detected in encoder signals.

The encoder is reversed. The output frequency has been set to the positive value, but the encoder signal is negative.

#### Troubleshooting

Change the frequency value polarity so that the encoder signal is positive. With some encoders, interchanging the encoder channels can be used to change the indicated rotation direction.

### 11.1.113 Fault 43 - Encoder fault, S5 - Encoder board missing

#### Cause

The encoder board is missing.

#### Troubleshooting

- Do a check of the encoder board.
- Do a check of the terminals.
- Do a check of the board connections.

### 11.1.114 Fault 43 - Encoder fault, S6 - Serial communication fault

#### Cause

Problem detected in encoder signals.

Serial communication fault. The encoder cable is not connected or there are interferences in the cable.

#### Troubleshooting

- Check cabling between encoder and OPTBE, especially Data and Clock signals.
- Check that actual encoder type matches with OPTBE "Operating mode" parameter.

### 11.1.115 Fault 43 - Encoder fault, S7 - Ch A / Ch B Mismatch

#### Cause

Problem detected in encoder signals.

Encoder channels A and B are mismatched.

#### Troubleshooting

Do a check of the cable connections and terminals.

### 11.1.116 Fault 43 - Encoder fault, S8 - Resolver/Motor pole pair mismatch

#### Cause

Problem detected in parameterization of option board.

There is a mismatch of the resolver/ motor pole pair number. Resolver pole pair number (if >1) is not matching the motor pole pair number.

#### Troubleshooting

Check that OPTBC parameter "Resolver Poles" and possible Gear Ratio parameters in application match motor pole count.

### 11.1.117 Fault 43 - Encoder fault, S9 - Missed Start Angle

#### Cause

Encoder zero positioning identification run has not been made.

The encoder start angle is missing.

#### Troubleshooting

Make encoder identification run.

### 11.1.118 Fault 43 - Encoder fault, S10 - Sin/Cos encoder feedback is missing

#### Cause

Problem detected in encoder signals.

For the closed loop control, encoder modes "EnDat only" or "SSI only" (absolute channel only) are not allowed.

#### Troubleshooting

- Do a check of the wiring, jumper settings, and encoder mode.
- Change OPTBE "Operating mode" parameter is either "EnDat+SinCos", "SSI+SinCos" or "SinCos only", or avoid using closed loop control.

### 11.1.119 Fault 43 - Encoder fault, S11 - Encoder angle is drifting

#### Cause

Error angle between the angle read from the absolute channel and the angle calculated from the incremental channels.

#### Troubleshooting

- Check the encoder cable, cable shield, and grounding of the cable shield.
- Check the mechanical mounting of the encoder and make sure that the encoder is not slipping.
- Check the encoder parameters (for example, encoder ppr).

### 11.1.120 Fault 43 - Encoder fault, S12 - Dual speed supervision fault

#### Cause

Encoder speed supervision. The difference between the encoder speed and estimated speed is too large. Dual speed supervision: Estimated speed and encoder speed difference is too high ( $0.05 \times f_n$  or minimum motor nominal slip frequency). See variable EstimatedShaftFrequency.

#### Troubleshooting

- Check the encoder speed signal ShaftFrequency vs. EstimatedShaftFrequency.
- If the ShaftFrequency is incorrect, check the encoder, cable, and encoder parameters.
- If the EstimatedShaftFrequency is incorrect, check the motor parameters.

### 11.1.121 Fault 43 - Encoder fault, S13 - Encoder angle supervision fault

#### Cause

The estimated shaft position error (estimated angle - encoder angle) is more than  $90^\circ$  electrical.

See variable EstimatedAngleError.

#### Troubleshooting

- Repeat the encoder ID run (absolute encoders).
- Check the mechanical mounting of the encoder and make sure that the encoder is not slipping.
- Check the encoder ppr number.
- Check the encoder cable.

### 11.1.122 Fault 43 - Encoder fault, S14 - Encoder estimated missing pulse fault, switch from the CL ctrl to the OL sensorless ctrl

#### Cause

Problem detected in encoder signals.

Software has detected too many missing pulses in the encoder. Closed loop control is switched to sensorless open loop control.

#### Troubleshooting

- Do a check of the encoder.
- Do a check of the encoder cable, cable shield, and grounding of the cable shield.
- Do a check of the mechanical mounting of the encoder.
- Do a check of the encoder parameters.

### 11.1.123 Fault 44 - Device changed (different type), S1 - Control board

#### Cause

- Option board or power unit changed.
- New device of different type or different power rating.

**Troubleshooting**

- Reset.
- If option board was changed, set the option board parameters again.
- If power unit was changed, set AC drive parameters again.

**11.1.124 Fault 45 - Device added (different type), S1 - Control board****Cause**

Option board of different type added.

**Troubleshooting**

- Reset.
- Set the power unit parameters again.

**11.1.125 Fault 49 - Division by zero in application****Cause**

Division by zero has occurred in application program.

**Troubleshooting**

- If the fault shows again while the AC drive is in run state, ask instructions from the local distributor.
- For an application programmer: do a check of the application program.

**11.1.126 Fault 50 - Analogue input  $I_{in} < 4$  mA (sel. signal range 4 to 20 mA)****Cause**

Current at the analog input is  $< 4$  mA.

- Control cable is broken or loose
- signal source has failed.

It is possible to set different responses in the application for this fault. See parameter group Protections.

**Troubleshooting**

Do a check of the current loop circuitry.

**11.1.127 Fault 51 - External fault****Cause**

Digital input fault.

Digital input has been programmed as external fault input and this input is active.

### Troubleshooting

Remove fault situation on external device.

## 11.1.128 Fault 52 - Keypad communication fault

### Cause

The connection between the control panel (or VACON® NCDrive) and the drive is defective.

### Troubleshooting

Do a check of the control panel connection and the control panel cable.

## 11.1.129 Fault 53 - Fieldbus fault

### Cause

The data connection between the fieldbus master and the fieldbus board is defective.

### Troubleshooting

- Do a check of the installation and fieldbus master.
- If the installation is correct, ask instructions from the local distributor.

## 11.1.130 Fault 54 - Slot fault

### Cause

Defective option board or slot.

### Troubleshooting

- Do a check of the board and slot.
- Ask instructions from the local distributor.

## 11.1.131 Fault 56 - Measured Temperature

### Cause

Shows temperature measurement fault for option board OPTBH or OPTB8.

- Temperature exceeded set limit.
- Sensor disconnected.
- Short circuit.

### Troubleshooting

Find the cause of temperature rise.

### 11.1.132 Fault 57 - Identification

#### Cause

Identification run has failed.

This fault is type A fault (Alarm).

#### Troubleshooting

- Run command was removed before completion of identification run.
- The motor is not connected to the AC drive.
- There is load on motor shaft.

### 11.1.133 Fault 58 - Brake

#### Cause

Actual status of the brake is different from the control signal.

It is possible to set different responses in the application for this fault. See parameter group Protections.

#### Troubleshooting

Do a check of the mechanical brake state and connections.

### 11.1.134 Fault 59 - Follower communication

#### Cause

SystemBus or CAN communication is broken between Master and Follower.

#### Troubleshooting

- Do a check of the option board parameters.
- Do a check of the optical fiber cable or CAN cable.

### 11.1.135 Fault 60 - Cooling

#### Cause

External cooling has failed.

Normally this fault comes from the heat exchanger unit.

#### Troubleshooting

Do a check of the reason for the failure on the external system.

### 11.1.136 Fault 61 - Speed error

#### Cause

Motor speed is unequal to reference.

#### Troubleshooting

- Do a check of the encoder connection.
- PMS motor has exceeded the pull-out torque.

### 11.1.137 Fault 62 - Run disable

#### Cause

Run enable signal is low.

#### Troubleshooting

Do a check of the reason for the Run enable signal.

### 11.1.138 Fault 63 - Quick stop

#### Cause

Command for quick stop received from digital input or fieldbus.

This fault is type A fault (Alarm).

#### Troubleshooting

Reset the fault.

### 11.1.139 Fault 64 - Input switch open

#### Cause

Drive input switch is open.

This fault is type A fault (Alarm)

#### Troubleshooting

Do a check of the main power switch of the drive.

### 11.1.140 Fault 65 - Measured Temperature

#### Cause

Shows temperature measurement fault for option board OPTBH or OPTB8.

- Temperature exceeded set limit.
- Sensor disconnected.
- Short circuit.

#### Troubleshooting

Find the cause of temperature rise or sensor malfunction.

### 11.1.141 Fault 70 - Active filter fault

#### Cause

Fault triggered by digital input (see param. P2.2.7.33).

It is possible to set different responses in the application for this fault. See parameter group Protections.

#### Troubleshooting

Remove fault situation on active filter.

### 11.1.142 Fault 74 - Follower fault

#### Cause

When using normal Master Follower function this fault code is given if one or more follower drives trips to fault.

#### Troubleshooting

Correct the fault cause on follower and reset fault.



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